



*To inspire ambition, to stimulate  
the imagination, to provide the  
inquiring mind with accurate  
information told in an interest-  
ing style, and thus lead into  
broader fields of knowledge  
such is the purpose of this work*

*The New*  
**PICTURED ENCYCLOPEDIA**  
*Volume Four*



MADE AND PRINTED IN GREAT BRITAIN BY THE ADAMANT PRESS LTD



# THE HAPPY FAMILY OF BRITAIN'S ROYAL HOUSE

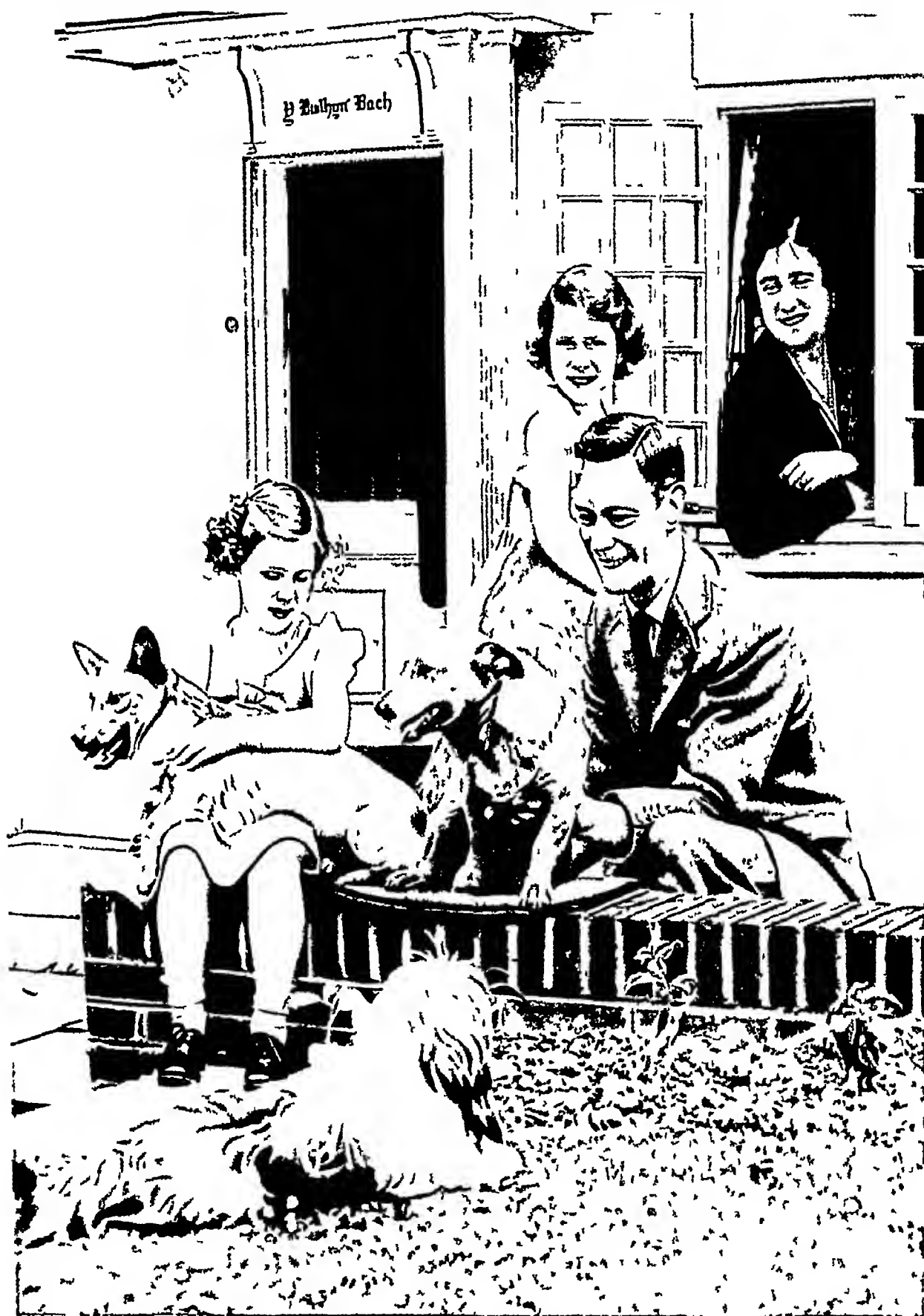


Photo Studio 11

This photograph shows an incident in the home life of our King and Queen when the cares of state put aside they could spend happy hours with Princess Elizabeth and Princess Margaret Rose whom we are proud to number among the Royal readers of *The New Book of Knowledge*. It is taken in the grounds of Royal Lodge Windsor outside Y Bwthyn Bach (The Little House) which was given to Princess Elizabeth on her sixth birthday by the people of Wales. (See article in page 1466) This delightful picture appears in *Our Princesses and their Dogs* by Michael Chance published by John Murray

By Royal permission

# THE NEW PICTURED ENCYCLOPEDIA

A Pictorial Treasury of Reading  
& Reference for Young and Old

*Edited by*  
SIR JOHN HAMMERTON

Editor, Universal Encyclopedia, Universal History of the World, Peoples of All Nations  
Countries of the World Encyclopedia of Modern Knowledge, New Popular Educator

With Eight Thousand Illustrations including  
nearly Eight Hundred in Colour & Photogravure

*Complete in Ten Volumes including Easy Reference Fact-Index  
Study Outlines and Topics Guide to Every Day of the Year*

VOLUME FOUR ELEM—GRAP

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# HERE AND THERE IN THIS VOLUME

*At odd times when you are just looking for "something interesting to read," without any special plan in mind, this list will help you. With this as a guide, you may wander through storyland, visit far-away countries, meet famous people of ancient and modern times, review history's most memorable incidents, explore the marvels of Nature and science, play games—in short, find whatever suits your fancy at the moment. This list is not intended to serve as a table of contents, an index, or a study-guide. For these turn to the Fact-Index and Study Outlines in Volume Ten.*

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# CAN YOU ANSWER THESE QUESTIONS?

*Since unnumbered thousands of questions are answered in each one of our ten volumes this page is intended merely as a sample of the pleasure and instruction that may be obtained by discovering interesting facts in this volume and passing them on to others in question form There are many thousands more for you to draw upon as tests in General Knowledge*

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## WHEN YOU ARE IN NEED OF READY REFERENCE

*In using THE NEW PICTURED ENCYCLOPEDIA as a work of reference Volume Ten is indispensable As regards its contents that particular volume is unique for it is at once a complete Index to the preceding Nine Volumes and an Encyclopedia in itself Its purpose is fourfold as indicated below*

(1) **Through the Year with the N P E** Its opening section takes the form of a Calendar of the Year, giving for each day all the chief events and matters of interest, with references to the pages of *THE NEW PICTURED ENCYCLOPEDIA* in which full particulars concerning the event, personality, or other interest of the day may be found. By the intelligent use of this section (a) the young reader can have the daily delight of reading about topics that have special association with the particular day of the year on which he may be making his reference (b) father or mother can suggest what would be the most appropriate reading for the day, and (c) the school teacher can set the lessons for the day with a genuine topical appeal.

(2) **Study Outlines** This large and important section of the volume provides a simple method of study which should enable any of our young readers to become expert in using *THE NEW PICTURED ENCYCLOPEDIA* as an auxiliary manual of home study, and thus what is learnt in school may be amplified and more securely fixed in the memory.

(3) **The Fact Index** Actually this is in itself a complete Encyclopedia. In addition to providing many thousands of references to contents of Volumes One to

Nine, it records many more thousands of facts in biography, geography, history, science, the arts, etc., that are not mentioned in its nine predecessors. Therefore, if you look in vain for any subject in the alphabetical order of Volumes One to Nine, turn to Volume Ten and you will almost certainly find it there.

*It is a good plan when using THE NEW PICTURED ENCYCLOPEDIA as a work of reference always first to look up any subject in the Fact-Index of Volume Ten*

(4) **Thousands of Additional Entries** Not only are all the many thousands of statements of fact that appear in the main body of the work carefully recorded in the Fact-Index for your immediate reference, but many thousands of additional entries are given in this exceedingly useful section of our work. By this method the reading pages of the work are saved from the burden of thousands of brief cross references which the ordinary encyclopedic method would involve. These new entries in the Fact-Index together with the treasury of reading embodied in Volumes One to Nine make *THE NEW PICTURED ENCYCLOPEDIA* the most comprehensive encyclopedic work produced in the present generation and assuredly the most readable encyclopedia of its kind.



## KEY TO PRONUNCIATION

Most of the subject headings in THE NEW PICTURED ENCYCLOPEDIA require no special indication of the way in which they should be pronounced. There are also many for whose proper pronunciation it is only necessary to know which syllable is stressed, in these cases the stress is shown *after* the syllable, thus A'jax. Where further guidance is necessary, the following signs are employed

ah = a as in father

aw = a as in ball

ê = vowel sound in fern, word, girl, curl

ow = vowel sound in now, bout

oi = vowel sound in noise, boy

Unmarked vowels have their short sound, as a in hat, e in bet, i in bit, o in not, u in but, oo in book

Marked vowels have their long sound, as in hâte, bê, bîte, nôte, tûne, bōon

Vowels in italics have a slurred or obscure sound as in abet (*a* bet'), recent (*rê* sent), conform (*kon* form'), nation (*nâ*'shun), tailor (*tâ*'lor)

th = first sound in thing, thank

th = first sound in the, that

zh = s in measure, leisure

g = hard g, as in good, girl

j = soft g, as in gem ginger

kh = guttural in loch

## LIST OF ABBREVIATIONS

The abbreviations most commonly used in this work are noted below. A much longer list of abbreviations often met with in reading or conversation is given in the Fact Index that is contained in Volume Ten.

A D, *Anno Domini* (in the year of our Lord, of the Christian era)

a m, *ante meridiem* (before noon)

b, born

B C, before Christ

C, Centigrade

c, *circa* (about)

Co, county, company

d, died

e g, *exempli gratia* (for example)

etc, *et cetera* (and so forth)

et seq, *et sequens* (and following)

F, Fahrenheit

h p, horse power

i e, *id est* (that is)

lb, pound, pounds (weight)

m, miles

MS, MSS, manuscript, manuscripts

oz, ounce, ounces

p m, *post meridiem* (after noon)

Pop, population

Pron, pronunciation

q v, *quod vide* (which see)

sq m, square miles

St, Saint

USA, United States of America

viz, *videlicet* (namely)

yd, yard

## ELEPHANT

# The GIANT EMPEROR of the JUNGLE

No incident in a travel film is more thrilling than a stampede of a herd of wild elephants, and nothing is more amusing than the tricks of the tame ones Here you learn the life-stories of both

**Elephant.** In past ages various species of mammoth roamed over the northern hemisphere Today there are but two representatives of this family of giants—the African and the Asiatic or Indian elephant Both have several distinct varieties Elephants are the largest and most powerful of living land animals, yet in captivity they are most docile, patient and faithful servants of Man, quick to learn and to obey orders

The African elephant is the larger attaining 11 feet in height, while the Asiatic never exceeds 10 feet The African elephant has larger ears and its forehead is convex in contrast to that of the Asiatic, which is concave The trunk, too, of the African species appears regularly ridged, and the margins of the extremity form two finger like lips, while that of the Asiatic elephant, on the other hand, is smooth and tapering, with but one lip There are also other distinctive differences, and so some zoologists have put these elephants in separate genera

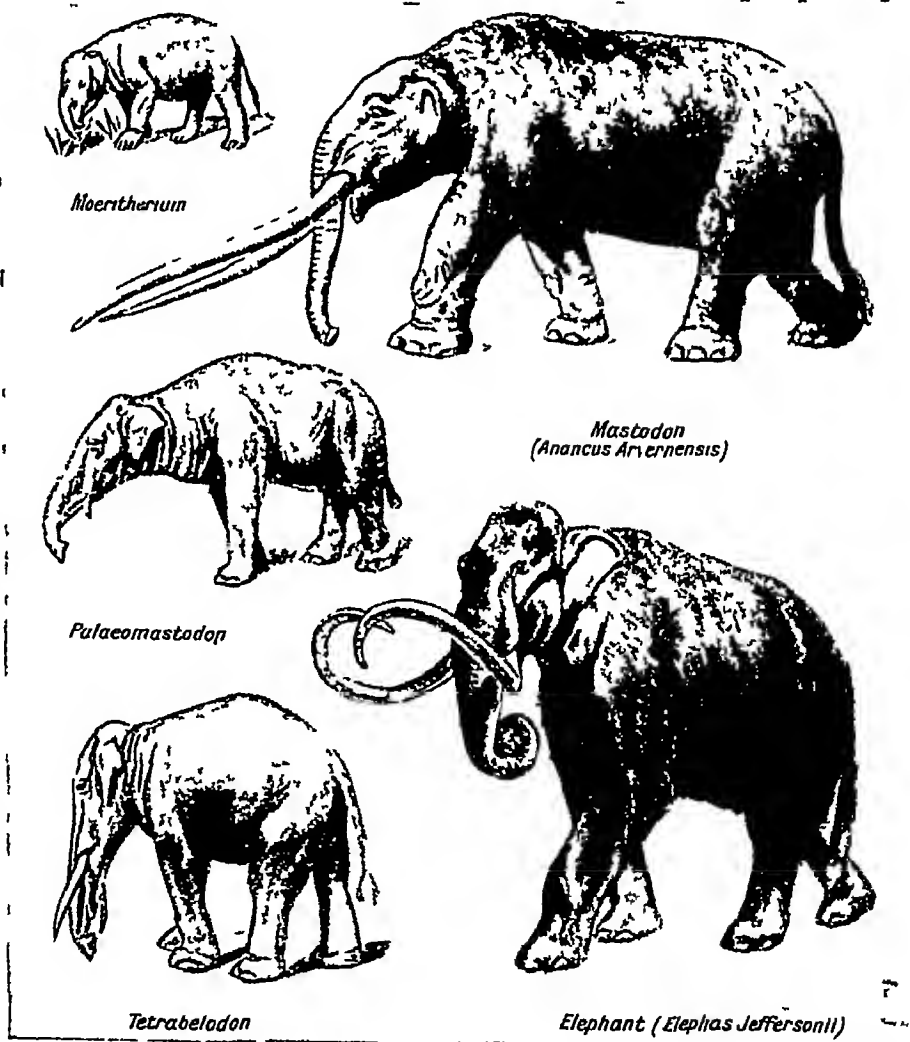
The range of the African elephant (*Elephas africanus*) is limited to the interior of the African continent, but the Asiatic (*Elephas asiaticus*) is not confined, as its alternative name might imply, to India It is found wild also in Ceylon, Burma, Siam, Cochin China, Sumatra and Malaya

The habits of the two species are similar All elephants are social, and herds numbering from 10 to 100 or more, usually led by females, are found in forests in the neighbourhood of streams,

although they move into open country during the rainy season and even ascend high mountains "Rogue" elephants are males that remain separated from the herd They are usually bad tempered and often dangerous

Elephants frequently migrate with the change of seasons to find better feeding grounds Like horses, they sleep either standing up or lying down and usually in the middle of the night or in the heat of the day In captivity they may not lie down for weeks, and individuals have been known to remain on their feet for five years

The elephant is an excellent swimmer, and instances are recorded of animals swimming



### EVOLUTION OF THE ELEPHANT

These five drawings show how the elephant has developed to something like its present size and shape in the course of hundreds of thousands of years Top left is seen its remote pig-like ancestor of Eocene times and then its increasing size through the Oligocene Miocene and Pliocene periods to *Elephas Jeffersonii* of the Pleistocene age an extinct type of modern elephant.

## ELEPHANT

continuously for six hours in water more than 30 feet deep. Elephants cannot leap and never have all four feet off the ground at the same time. They display remarkable speed in running.

Normally, the elephant is timid and docile, but when enraged it can become very dangerous. When about to charge an enemy it utters shrill, loud "trumpetings," rolling up its sensitive trunk as a measure of precaution. When pleased it squeaks or purrs softly. Rage is expressed by a roar, suspicion by rapping the trunk on the ground and emitting a volume of air with a sound like tin-foil crinkling.

Naturalists tell us that the intelligence of the elephant is popularly overrated. It is, as we have seen, very docile and obedient, and is easily trained. Wild elephants use branches of trees to brush away flies, or, lacking foliage, they throw grass or spout water over the body. Big as is the elephant its naked skin is very sensitive.

### Elephants Put to Work

In India elephants are regularly employed in heavy work, in all of which they exercise care and accuracy. They haul logs and lift and carry timbers or boxes of merchandise. An elephant is capable of carrying half a ton over level country. In hauling heavy loads a regular harness is employed consisting of a leather collar round the neck to which a dragging rope is attached. Elephants are also sometimes harnessed to wagons or ploughs.

For riding, a padded saddle is usually placed on the back of the elephant, and on this is bound a box called a *howdah*, to carry from two to six passengers. The driver or *mahout*

sits astride the elephant's neck. In Siam and Ceylon white (albino) elephants are held sacred.

So great is the mother's care that a baby elephant rarely dies. When on the march mothers and young go in advance, but if an alarm is sounded they immediately fall back, and the old males go to the front. The young elephant returns the mother's affection in full and resists to the utmost any indignity that may be offered her.

In India elephant drives take place about every ten or twelve years, the object being to replace stock that may have died while in captivity. For several weeks before the elephants are due to be captured, a small army of beaters goes through the forest and jungle to drive the animals to the areas where they will finally be rounded up.

When everything is ready for the last stage of the drive, a terrible noise is set up by the beaters and their helpers, in order to stampede the animals in the right direction. Soon they are driven into the selected stockade or enclosure and then forced to enter an inner enclosure, where they are at last tied up.

Since early times elephants have been killed for their ivory tusks, and not long ago more than 40,000 African elephants were killed every year for this reason. (*See Ivory*)

Until comparatively recently elephants were regarded as fair game by big game hunters, but now their indiscriminate slaughter is discouraged by the governments concerned. Today special licences are necessary for elephant "shoots," and they are granted very sparingly.

## The Story of Mogul the Elephant

PETER'S Uncle John had just come back to England, after spending several years in India. He had never seen his nephew before, so he was anxious to make friends with him.

One day he took Peter to the Zoo, and they saw the animals in the Pets' Corner. There was a baby elephant which Peter liked so much that he still talked about it when he got back home.

"Do all elephants live in a zoo?" Peter asked his uncle.

"No, Peter," replied Uncle John. "The real home of the elephants is in the jungle."

"What is a jungle? Have you ever seen one?" cried Peter.

"A jungle is rather like a very large forest, only the ground is so overgrown with all kinds of rank and tangled plants that it is sometimes difficult to get through it. Wild animals, like the elephants, often make their homes in such places. When I was in India I went through a jungle and saw a lot of elephants."

"Did you ever see any baby elephants, like the one at the Zoo?" questioned Peter.

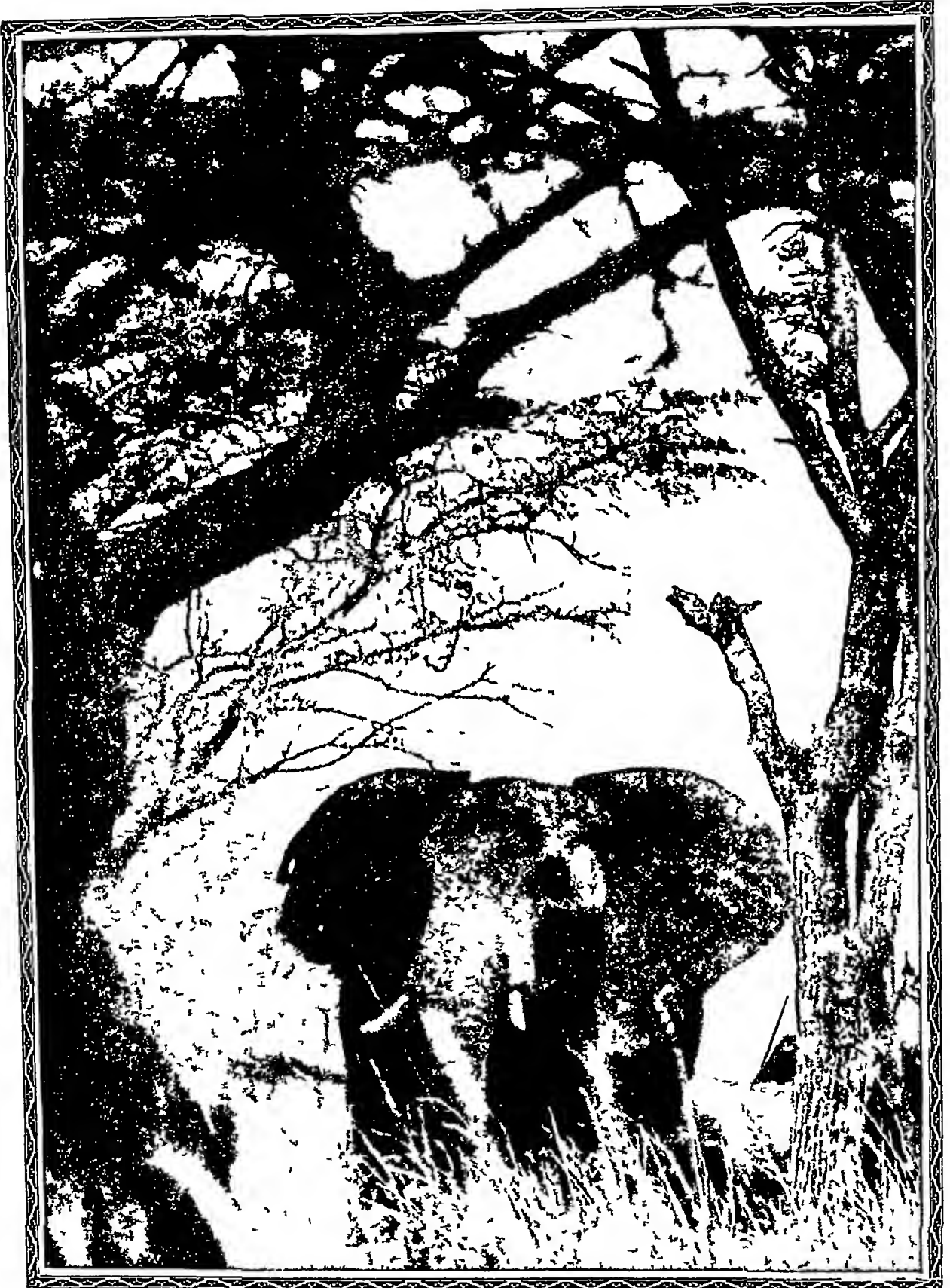
"Yes," said his uncle. "I once helped to capture a whole herd of elephants, and one of them was a baby that we had to teach to drink milk from a bottle."

"Oh!" cried Peter, excitedly clapping his hands. "Do tell me all about it!"

They sat down in front of the fire, and Uncle John began. "The government of India won't let people shoot wild elephants unless they are dangerous old 'rogue' elephants, or unless they are injuring the crops. Well, Mogul—that was the name we gave this baby elephant when we caught him—was born in the jungle, for his mother was one of a herd of forty or fifty wild elephants. And he lived in the jungle with the herd until he was about a year old."

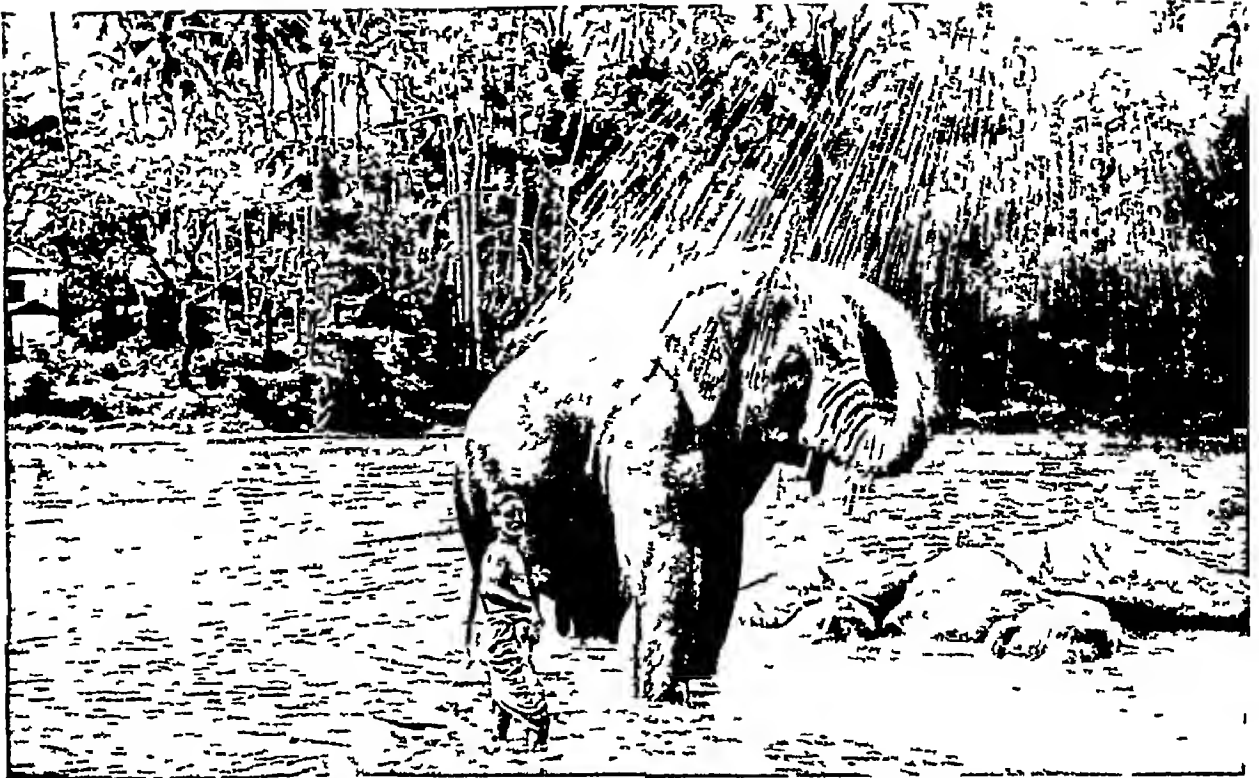
"Baby elephants, you know, are awfully funny! At first Mogul was only three feet high, and he weighed about as much as a big St. Bernard dog. He had the funniest little trunk

## A SECOND LATER THIS ELEPHANT CHARGED!



The person who knows the Elephant language will always start seeking a place of safety, when he sees an Elephant looking like this. This is a mother African Elephant who was hastily snapped by the photographer, just as she had made up her mind that her young son was in danger. The sign of warning is the spreading of the ears accompanied by trumpeting. A second after this picture was taken the Elephant charged, but the bold picture man had dodged safely out of view.

## ELEPHANT



### AN ELEPHANT'S BATH

One thing an elephant loves is a good wash, and here is a fine tame specimen spraying himself thoroughly with his trunk. But even if he were the wildest old bull that ever walked the jungle he would behave in just the same way.

only as long as a 12-inch ruler. But you never saw such a baby for growing! When he was a year old he weighed half a ton.

"During the daytime the elephant herd hid in the thickest part of the forest, and the baby elephants played hide and seek about their mothers. When the herd set out to feed at night, the elephants travelled in single file, plucking grass and leaves and twigs of trees with their trunks and stuffing them into their wide mouths.

"And do you know who led the herd? An old cow elephant, the wisest and most experienced of the lot. Most of the time the bull elephants were off by themselves. At the least sign of danger the little baby elephants cuddled right between their mothers' legs, while the mothers shuffled along so as not to hurt their babies. And when there was a deep stream to cross, the young elephants that could not swim rode across on their mothers' backs.

"That's the way Mogul lived until he was a little over a year old. Then we trapped them, the whole herd, except for one or two that broke through and got away.



### BABY ELEPHANT SAFE AND SOUND

Safety indeed is what this little baby elephant has found tucked right away underneath his mother's trunk. You can see how small he really is too by comparison with her great bulk, and another sign of his extreme youth is the fact that his tough hide is still covered with a certain amount of almost woolly down.



## ELEPHANT

"You see, we'd been watching that herd for quite a while, and when the government wanted more elephants to train for work we were all ready. With about a hundred natives we surrounded the herd, and by fires and shouts kept them from breaking through. This lasted for nearly a week, while we were building a big, ring shaped fence or enclosure called a 'keddah'. It was about 50 yards across and was made of logs 12 feet long and a foot thick, set close together in the ground. You can imagine it had to be strong to hold a herd of elephants! And on each side a wing-fence of stakes was built, making a sort of big funnel

flapping! And all the time he was shrieking as hard as he could. He *was* angry. He was the noisiest animal in the whole herd. But at last the men got him tied fast to a tree by means of a native's loin-cloth and a jungle vine.

"It was then that Mogul learned to drink out of a bottle. His mother was one of the elephants that got away, and he was too little to live on grown elephant food. So after a bit I tried to quieten him by bringing him some milk to drink.

"But—would you believe it?—that elephant didn't know how to drink milk! Elephants suck up water through two long tubes in their



AN ELEPHANT CAGE FOR THE ROUND UP

To make ready for an elephant round-up, natives build a 'keddah' with a long V-shaped approach. Heavy posts, braced with beams and bound with rattan, form the stockade. Then beaters surround a herd, and drive it towards the pen. Bellowing furiously, the animals charge blindly down the runway into the trap, while, outside, men with long poles prod the captives to keep them from plunging through the walls.

down which the elephants could be driven to the narrow entrance to the keddah.

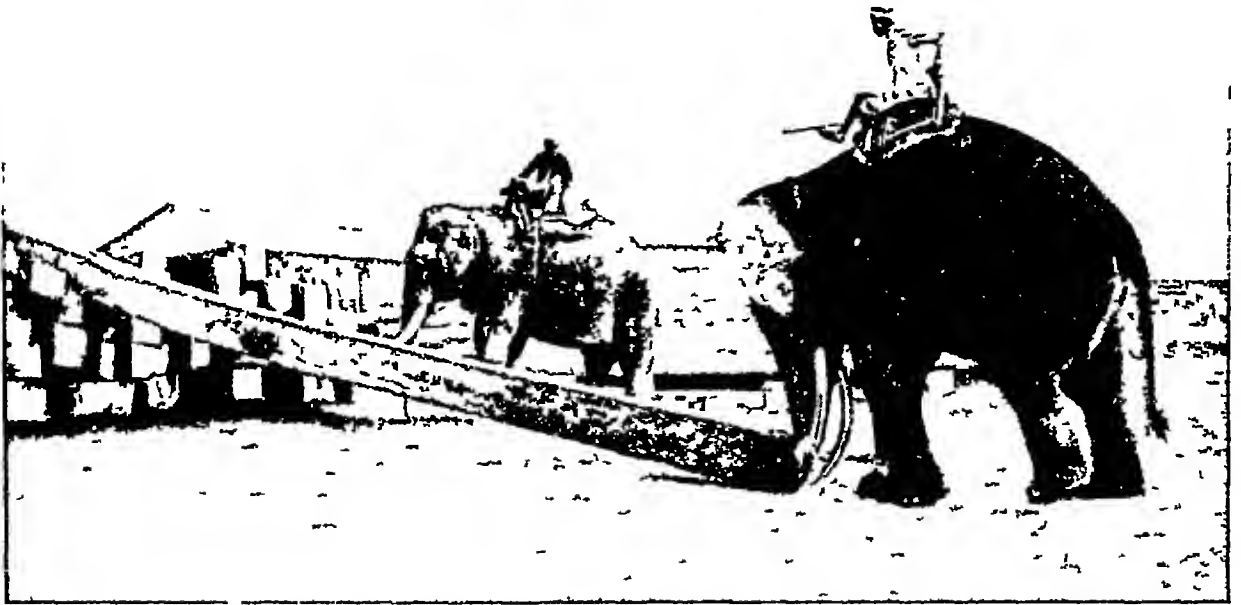
"The first anybody saw of this little Mogul elephant was when the herd had been driven into the keddah and the grown elephants were all tied up, with the aid of the tame ones that help in the work. Then we saw this funny little elephant calf, with a pink and white mark over one eye and ear, charging about the keddah. Once you'd seen him you'd know him anywhere.

"When the men tried to catch him, Mogul chased them all over the place—with his little tail and trunk up in the air, and his ears

trunks, but little Mogul didn't know what to do with a bowl of milk we put before him.

"At last we had to get a bottle and pour the milk into his mouth from that, then he drank it greedily enough. And for some months that was the way he always took most of his food. The funniest thing was that all the time he was being fed the little rascal would keep shrieking at the top of his voice."

Here Uncle John stopped and picked up his pipe. He proceeded to fill it slowly, and before he could light it Peter asked, "Isn't there any more of the story? What happened next?"



### JUMBO MAKES HIMSELF USEFUL IN THE TIMBER YARD

Here are two elephants helping in a Burmese teak yard in just the same way as Mogul whose adventures you read in the story in this page. You can see for yourself how the one nearest the camera is using his trunk and his big, curved tusks to get down and heave at the great balk of teak—and, remember, this is one of the heaviest of all woods. On his back sits the mahout as the elephant's keeper is called, but a well-trained elephant knows just what to do without having to be told.

"Well," said Uncle John, "after a time, his master had a little shed built for him near the stables, and soon he was as friendly as a big dog. Every day he would come up to the kitchen to receive his milk and some bananas. When he saw his master walking in the grounds, he would trot up to him, twist his little trunk round his arm, and plead to be taken to the fruit trees. Sometimes the grass cutters let him carry home a load of fodder on his back for the other elephants. And once he slipped into the house, helped himself to a basket of oranges on the sideboard, and accidentally swept off all the china and glass on to the floor!"

"The grown elephants that had been trapped with Mogul had long ago been put to work, for it takes only a few weeks to tame wild elephants. At last the time came when Mogul was trained to work. He was fitted with a rope harness and learned to pull and push and start and stop at the word of command. He had a native driver who sat on Mogul's neck and drummed with his heels and guided the little elephant by touching his ears with an elephant hook. When he talked to Mogul, he called out, 'Ho! my son,' and Mogul became very fond of his 'mahout,' as the driver was called.

"When Mogul became older and his tusks had grown, he was set to piling teak logs in a timber yard. He would go to a log, kneel down, and thrust his stout tusks under the middle of it. Then he would curl his trunk over the log, rise up, carry the log to the proper pile, and place it carefully on top. By and by Mogul learned to do all this without a single word of command. Female elephants are

not used for such work as they have no tusks. One day Mogul was helping to build a stone wall, and was carrying stones on his tusks and putting them carefully in their places. Presently a stone he was carrying fell off and slipped part of the way over a cliff. His mahout patted him on the head and said:

"'Ho, my son! Get it, now. Nothing to be afraid of'."

"But Mogul knew that the ground near the cliff's edge was treacherous, and he would not go near it. Men had to drop a chain over the stone. Then Mogul braced himself and pulled until the stone was up on the road again. Mogul, you see, had become as wise as well as a strong and faithful elephant. When I left India soon after that, everybody said that he was one of the best of the younger elephants in all that district."

Uncle John got up and stretched himself, and knocked the ashes out of his pipe. Peter gazed into the fire and said wistfully:

"I wish I had a little elephant."

Uncle John laughed. "An elephant! Who do you think would take care of him, Peter? And what would happen to that fine pony of yours and the puppies?"

"Well, perhaps it wouldn't do to have an elephant after all. Oh, I've forgotten to give my pets their supper. I must hurry up and take it to them," said Peter, and off he ran.

**Elgar, Sir Edward William (1857-1934)** Although Elgar was no revolutionary in musical form—Bernard Shaw once said of his music that "you may hear all sorts of footsteps in it"—there is a stamp of individuality about his

compositions that is none the less real for all its elusiveness. In spite of a certain sentimentality and formalism, all his works have brilliance and richness, and in particular his instrumentation is balanced and suave. That his compositions are worthy of a very high place in the annals of English music is undoubted.

Elgar was born at Broadheath, near Worcester, June 2, 1857. His parents were Roman Catholics, his father being organist at St. George's Roman Catholic Church at Worcester. He was largely self-taught as a musician, although he learned much from his father (whom he succeeded as organist at St. George's in 1885), from the cathedral services at Worcester, and from the Three Choirs Festivals. In 1889 he married and moved to London. The "Froissart Overture" (1890), "The Black Knight," for chorus and orchestra (1893), and "King Olaf" and "The Light of Life" (both 1896) were produced with some success in the provinces. By this time Elgar, who, having found little encouragement in London, had moved to Malvern in 1891, was beginning to receive critical attention, and in 1899 came his well-known "Enigma Variations," which established his reputation.

He now turned to choral work on a large scale. "The Dream of Gerontius," produced at Birmingham in 1900, did not at once receive the recognition it deserved, but proved a great success at the Lower Rhine Festival at Düsseldorf. This German appreciation caused its revival at Worcester two years later and in London in 1903, these performances establishing it as the finest imaginative choral work written by an Englishman and one of the great choral works of all time. "The Apostles" and "The Kingdom," two more oratorios, followed in 1903 and 1906. Meanwhile, Elgar had been knighted in 1904, in which year the first Elgar Festival was held at Covent Garden. Next, Elgar turned to instrumental and orchestral work. His "First Symphony" (Manchester, 1908) enjoyed an immense success, equalled by that of the "Violin Concerto" (1910) and the "Second Symphony."

This was virtually the end of Elgar's productive period, although other pieces, including the "Falstaff Overture" and the commemo-



SIR EDWARD ELGAR

Elgar is perhaps the greatest English composer of all time. His music, noble in its conception, truly reflects the English character and English sentiments.

rative odes during the War years, were produced with success, and many earlier works, such as the "Pomp and Circumstance" marches, the overtures "Cockaigne," "Sea-Pictures," and others were revived. His patriotic song, "Land of Hope and Glory," may almost be regarded as the National Anthem of the Empire. Elgar was awarded the Order of Merit in 1911—he was the first musician to gain that honour—and was made Master of the King's Musick in 1924, receiving a baronetcy in 1931. He died February 23, 1934.

**Elgin Marbles.** (Pronounced el'-gin) In many ways the world of today is far in advance of the world of a thousand, or even a hundred, years ago. Miracles of discovery and achievement stand up as milestones along this wonderful road of human progress. Marvellous are the advances that have been made in surgery, shipbuilding, wireless communication, machinery and transport, to mention only a few of the countless departments of human activity and enterprise in which the present far outdistances the past.

Nevertheless, there is at least one department of the fine arts in which the masterpieces of one ancient civilization remain supreme and unrivalled by anything in the modern world, and that is Greek sculpture. Nothing that has been chiselled from marble during all the centuries of the Christian era, and in all the countries of the world, can at all compare with the sculptures of Pheidias, the Athenian, who was born about 490 B.C. His work still stands unchallenged as the noblest ever produced by human hands.

#### From Greece to London

Is it not, then, a very wonderful thing that the finest surviving masterpieces of the greatest of the Greek sculptors are today treasured in the very heart of London, where they may be seen on any day of the week by any visitor to the British Museum?

The story of the Elgin Marbles is in many respects as wonderful as some fairy tale. In order to understand the story aright, it is necessary to say something, first of all, concerning the creation and purpose of these noble sculptures.

When the ancient Greek civilization was at the height of its power and glory, one of the ways in which it sought to express its love for





LOVELY SCULPTURES SAVED BY LORD ELGIN

Among the chief treasures of the British Museum in London are the Elgin Marbles, which once formed part of the frieze of the Parthenon Athens and were brought to England to save them from utter destruction. The portion in the photograph, showing a rider about to mount, is typical of the excellence of the conception and perfection of execution.

the beautiful was by the erection and adornment of magnificent temples. This desire to express beauty and national greatness in some triumph of architecture is a very human trait, and has been successfully achieved in England by the creation of our many beautiful cathedrals.

Amongst the noble buildings set up in Athens during this period the most important was the Parthenon, which was built between 447 and 438 B.C. It was a temple of the virgin goddess Athena (Minerva). Its site was a fortified hill of rock called the Acropolis.

The Parthenon was of the style of architecture known as Doric. It was surrounded by a colonnade with eight lofty columns at each end, and seventeen on each side. The building was 228 feet in length, 101 feet in breadth, and 66 feet high. It contained a statue of Athena Parthenos, as well as other public treasures, and was used as a place of worship.

The whole temple was built of white marble, and as Athens was then the most important and the richest city in Greece, the adornment of the temple was carried out on a scale never attempted before or since, and Pheidias, the greatest sculptor in Greece, or, indeed, in the world, was employed on this task for years.

The sculptures used in beautifying the temple were of three distinct types. In the gables which surmounted the columns on the east and the west ends there were magnificent groups of statuary, that on the east representing the

birth of Athena, and that on the west the contest of Athena with Poseidon (Neptune) for Attica.

Along the summit of the columns on each side of the temple there was another series of decorations, called metopes, each consisting of a block of marble about three feet square on which were sculptured in bold high relief combats between Lapithae and Centaurs. Then along the top of the outer wall of the cella, or temple, within the colonnade, was a frieze in low relief, representing the Panathenae Procession, the great festival of the Athenians.

The Parthenon was undoubtedly one of

the most beautiful buildings ever erected by Man, and even as a ruin it is one of the wonders of the world. It is with the surviving relics of its best statuary—now known, together with the temple of Nike Apteros (Wingless Victory) at Athens, and various antiquities from other parts of Hellas, as the Elgin Marbles—that we are chiefly concerned.

#### Lord Elgin and the Statues

When Lord Elgin was appointed Ambassador to Turkey in 1799, the Parthenon was in a state of ruinous decay. Greece was then part of the Turkish Empire, and the Turks had very little interest in the care of these monuments of Greek art. Many of the statues had fallen down, and the whole eastern end of the temple had been shut in by Turkish houses, built on the fallen ruins. It was notorious that statues by Pheidias had been pounded up into mortar to make the walls of hovels and outhouses!

Lord Elgin, who was intensely interested in Greek art, began to make plaster casts of many of the remaining sculptures, and when the British Government declined to pay any of the expenses of this work, the ambassador defrayed the ever growing cost out of his own pocket. Enthusiasm grew as the work proceeded, and before long Lord Elgin conceived the idea of securing plaster casts and of rescuing the actual statues and other sculptures from further mutilation and spoliation by transferring them to England.

## ELGIN MARBLES

The enterprise and influence of Lord Elgin enabled him, in 1801, to secure from the Government of Constantinople authority to excavate among the ruins of the Parthenon, and an assurance that he was "not to be hindered from taking away any pieces of stone with inscriptions or figures."

### The Removal of the Marbles

Armed with this authority, he soon secured, by further presents, the good offices of the Governor of Athens who allowed a metope to be taken away bodily and sent to England. Soon Lord Elgin, his assistants, and three or four hundred workmen were hard at work. Statues were lowered from the pediment, metopes and slabs of the frieze were removed.

houses built on the rubbish were purchased, pulled down, and their foundations explored.

In a little over a year two hundred huge boxes filled with sculpture were ready for shipment. But several years of disappointment were to pass before these treasures found a permanent home in England. The Napoleonic wars were in progress, and in 1803, on being recalled from Turkey, Lord Elgin was "detained" by the French and confined in Paris. It was not until 1812 that the sculptures at length arrived in England. From first to last Lord Elgin had expended over £70,000 on the collection.

Finally, Parliament agreed to purchase the Elgin marbles for the nation, the price paid being £35,000.



### SCENES OF ANCIENT GREECE IN THE ELGIN MARBLES

Here are two of the finest sections of the Parthenon frieze removed from Athens by Lord Elgin in 1801-03. At the top are young Greek knights on their prancing steeds in the wake of a procession in honour of the goddess Athena. Although the carving is not more than 2½ inches at its deepest the illusion of several horsemen riding abreast is complete. The lower section shows a group of magistrates conversing while waiting to take their place at the head of the procession.

British Museum

# The WOMAN who WROTE 'ADAM BEDE'

*England has produced some remarkable women novelists, and among them George Eliot, as Mary Ann Evans called herself, occupies a high place, though her books are nowadays less widely read than in an earlier generation*

**Eliot, GEORGE (1819-1880)** Under this masculine name Mary Ann (or Marian) Evans became famous as one of the world's greatest novelists. Born in Warwickshire, she grew to womanhood on the beautiful old estate of Arbury Hall, of which her father, Robert Evans, was the manager. Thus she gained that intimate knowledge of English rural life which forms the background of several of her novels.

Called from a girls' Methodist school at Coventry by the death of her mother, Mary Ann Evans at the age of seventeen became the sole companion and the housekeeper of a father of narrow mind and Puritanical strictness. In one way this was a fortunate circumstance, for, obliged to educate herself, she followed her own bent for the classical languages, German, Italian, music, philosophy, science and ancient and modern literatures. Thorough in everything she did, she made herself a woman of wide and varied scholarship, but the years of loneliness left their mark.

She was not unknown when, at the age of thirty, after her father's death, she went to London as assistant editor of the "Westminster Review," for she had already contributed critical papers to that magazine and translated scholarly works from the German. So she was welcomed in the most distinguished literary circle. But in a group which numbered Spencer, Carlyle, and J. S. Mill, George Henry Lewes alone suspected that the genius of this intellectual but modest country woman was remarkably creative, and urged her to write fiction. Her subsequent relationship

with Lewes—which she regarded as marriage although Lewes' first wife was not divorced—shut her out from all society but his and that of a small group of faithful friends. She entered into this union with deliberation, and never admitted disloyalty to her own conscience, but her preoccupation with the problems of married life, her continual insistence on the binding nature of promises between husband and wife, are pathetic testimony to her uneasiness in a position that could so easily be criticized from her own standard of duty.

Mary Ann Evans herself had so little confidence in her powers and was so sensitive that she published her "Scenes of Clerical Life" under the *nom de plume* of "George Eliot." The stories, which were first published in "Blackwood's Magazine," met with a most enthusiastic reception. They showed what a remarkable knowledge she had of country life and interests, her character studies being most faithfully presented. The author was assumed to be a man, and she did not make herself known until the next year, when "Adam Bede" won for her a lasting fame.

George Eliot's conceptions were of noble design, her style pure and her stories significant. Her characters were analysed with scientific accuracy, yet again and again she struck the unforgettable human note. She had deep feeling for her fictitious people, and cared too much about them to be impersonal, nevertheless, she is the least sentimental of women writers. Her novels are of such a variety, interest, and individual distinction that there



FAMED AS 'GEORGE ELIOT'

Like many other women novelists Mary Ann Evans chose to write under the name of a man and she is remembered better as George Eliot than by her maiden name or by that which she bore as the wife of J. W. Cross. This portrait is from a drawing by Sir Frederick William Burton.

National Portrait Gallery, London

is no agreement as to which one out of three or four is her masterpiece. But it is agreed that all her stories owe their vitality to her marvellous character drawing. Her poems are marked by scholarship and art, but lack the appeal of her prose.

To the end George Eliot's personal life was one of struggle and painful experiences. While she sustained with dignity and courage a difficult situation of her own making, she suffered from adverse criticism to a tragic degree, and was singularly dependent upon the watchful affection of those who loved her. She never recovered from the shock of Lewes's death, which occurred in 1878. Two years later George Eliot married John Walter Cross, but she died in the same year, on December 22, at 4, Cheyne Walk, Chelsea.

The scenes of George Eliot's novels are laid almost entirely in four midland counties of England—Warwickshire, Staffordshire, Derbyshire and Lincolnshire. St. Ogg's of "The Mill on the Floss" is identified with Gainsborough in Lincolnshire, Milby with Nuneaton, and Shepperton with Chilvers Coton, her birthplace, both in Warwickshire, and Snowfield with Wirksworth in Derbyshire. The Hayslope of "Adam Bede" is thought to be the village of Ellastone in North Staffordshire, a fascinating locality through which flows the river Dove.

George Eliot's principal works are "Scenes of Clerical Life" (1858), "Adam Bede" (1859), "The Mill on the Floss" (1860), "Silas Marner" (1861), "Romola" (1863), "Felix Holt" (1866), "Middlemarch" (1872), "Daniel Deronda" (1876).

## *Silas Marner, the Miserly Weaver*

IN the days when cloth was woven on hand-loom, the sociable hum of spinning-wheels and the clatter of treadles came from many a cottage in many an old English village. As weaving was a simple trade that could be carried on anywhere, a workman now and then went off by himself. Thus it was that Silas Marner appeared in the hamlet of Raveloe.

A skilful weaver of fine linen, he soon had plenty of well-paid work to do, and should have won for himself a warm welcome. But he refused to give any account of himself, and made it plain that he wanted no neighbours. Setting up his loom in a hut on the moor, between the last hedgerows and an old stone pit that was half filled with foul water, he hid himself away from everybody.

There was much gossip about him, for such conduct was unnatural in a young man who was still under 25. His pallid face, too, had the look of one harassed by trouble or guilt, and with his prominent short sighted brown eyes, which saw little beyond his own nose, he looked a staring, white faced, furtive creature. So the stranger soon got an evil reputation that he did not deserve.

In truth Silas Marner had been a devout and respected member of a Methodist community of linen weavers. When Church funds were stolen, suspicion was cast upon him by the real thief, who had been his nearest friend. Unable to prove his innocence, he had fled from his home, and, soured by treachery, he distrusted and avoided all men. In his lonely cottage in Raveloe his life, no longer fed by human fellowship and faith in God, dwindled like a starved plant trying to grow in a cellar.

To forget his trouble he toiled long hours at his loom, and thus earned more than enough for his needs. Spending only the copper and

silver, he put the gold away. And having no natural pleasures for the long lonely evenings, Silas came to love his growing hoard of gold.

After supper he locked his door and shutters, and lifted the leather bags of treasure from their hiding place under loosened bricks beneath his loom. The glitter of the coins as they trickled through his thin eager fingers, or stood in neatly counted piles, was sunshine to his warped and gloomy soul. In fifteen years the heartsick young recluse was turned into a prematurely



**SILAS DISCOVERS EPPIE**

Still not fully recovered from his serious illness, Silas Marner thought that the little girl, lying before his fire, was his lost gold mysteriously returned to him.  
By courtesy of William Blackwood & Sons

aging miser, who was known to the fearful children of Raveloe as "Old Master Marner"

One rainy evening, after his return from an errand in the village, he ate his supper, locked the door and shutters, and, setting a candle on the floor, lifted the loose bricks. His gold was gone! Stark terror filled him, then wild despair. With a scream he rushed out into the rain



#### WHERE SILAS FOUND LITTLE EPPIE

Once Eppie ran out by herself and poor old Silas was very worried for fear some ill might have befallen her. He found her safe and sound by the pond using her little boot as a bucket. In describing such scenes of childhood life George Eliot is at her best.

"Robbed!" he gasped, "robbed!" as he burst into the Rainbow Inn that was full of gossiping idlers.

"He's off his head," said the landlord, for indeed the poor mud-stained and dripping weaver looked like a distracted ghost.

Officers of the law scoured the country, but neither the thief nor any trace of the gold was found. But Silas Marner's loss won for him the sympathy of his neighbours. He was stopped in the lanes by kindly inquirers, and Mrs. Dolly Winthrop, the wheelwright's wife, who was always first with help and comfort in a time of trouble, broke in upon his solitude. As an excuse for a friendly call she brought some cakes.

"You doing all for yourself!" she said, compassionately. "And men's stomachs are made that comical they want a change now and then—God help 'em."

#### Living in a 'Withering Desolation'

"Thank you kindly, ma'am," said Silas with feeling, for there was no mistaking the simple neighbourliness of this good woman. He had been living "in a withering desolation." Work filled his days, but for the lonely evenings there was no "phantasm of delight." The fires of life were burning low when Mrs. Dolly made his Christmas a little less cheerless with her friendly

visit and gift. And all unknown to him a new life was coming with the new year.

Since there was nothing to be stolen he did not lock up his house when he went abroad. Coming home in a snow storm on New Year's Eve, he found his door blown open by the wind. The fire had almost died, and when he stooped to mend it, suddenly to his short-sighted vision there appeared to be his gold heaped upon the hearth. But instead of hard coins his trembling fingers clutched the soft golden curls of a sleeping baby!

Long, long before, Silas Marner had had a little sister—just such another yellow-haired, pink and dumpled morsel of a girl as this. Tender memories stirred him, and when with a cry of "Mammy!" the child sat up, he lifted her to his knee. He fed her with porridge and brown sugar, and took off her little soaked shoes. Breaking into happy chuckles, the baby played with her toes. When he found the mother—a wretched, wandering woman who was unknown in Raveloe—dead in the snow of a furze bush, he refused to part with the child.

"She came to me. I have a right to keep her. She's a lone thing and I'm a lone thing." He clung to her desperately.

"Well, I'm sure that's right," said Mrs. Dolly Winthrop. "Besides, she's a winsome little maid as it would break anyone's heart to see go on the parish." So

Mrs. Dolly brought her own children's outgrown baby clothes, worn and patched, but as sweet and clean as spring blossoms, and showed the awkward but eager bachelor how to dress the rosy little waif. He wanted to do everything for her himself lest she grew fonder of someone else. Then he went to church to have his adopted child christened, naming her Hephzibah after his dead sister. But for that Biblical name, which overwhelmed Mrs. Dolly, he had a dear short one, "Eppie."

#### Eppie Becomes Everybody's Favourite

Silas Marner had loved his gold in secret behind a locked door, but Eppie he loved in the sunshine before all the world, for the little girl was soon toddling out to the moor and along the hedgerows. He could not leave her, but was obliged to take her with him on every errand. So when he bought supplies or delivered his webs of beautiful linen, he was met by friendly faces and inquiries. Everywhere he must sit awhile, and eat a bit, and talk about Eppie. An adorable child, Eppie was soon the pet of the countryside, and she linked her happy foster father again with the human world.

Very soon the active child was in every sort of mischief, so that, when he worked at his loom, Silas had to tie her to the frame with a



strong linen band He never punished her but once By Mrs Dolly's advice he put her into the black coal-hole for running away to the dangerous stone pit, where she might have been drowned Eppie, thinking this a new and delightful game, returned as soon as he had washed and dressed her Peeping out with the blackened face of a laughing imp, she cried "Eppie in a toad hole aden, Daddy Opy door!"

The years went by The hut grew to a neat stone cottage, and around it Eppie's blooming garden was fenced with furze bushes and stones from the moor And Eppie herself grew to a winsome lassie of 17 Then in a season of drought the old stone pit went dry, and Silas' gold was found at the bottom with the bones of the thief who had stumbled to his death on that rainy night And Eppie's father was discovered to be a gentleman, who had married

her mother secretly, and, finding her unworthy, deserted her Eppie could have become a lady and the heiress of an old manor farm, but she clasped her arms tight round the neck of the only father she had ever known

"Thank you, sir," she said "Your offers are far above my wish I should have no delight i' my life if I left my daddy and knew he was feeling lone He took me in, a little child, when you deserted and denied me, and I can't feel as I've any father but him And here he'll sit, when he is old, with me to fend for him" She ended with a gush of warm tears "I'm promised to marry Aaron Winthrop, as'll live long o' father and help me care for him"

So when the lilacs and laburnums bloomed above the lichened walls, the bell pealed from the ivied tower of the village church, inviting everyone to Eppie's wedding

## The 'VIRGIN QUEEN' of ENGLAND

*Men living in Elizabeth's reign thought of it as a second "Golden Age," so blessed was England then with great adventurers, statesmen, and poets But they knew, too, what they owed to the queen they called "Gloriana"*

**Elizabeth, QUEEN OF ENGLAND (1533-1603)** The long reign (1558 to 1603) of the "Virgin Queen" was one of the most important



in the annals of English history Elizabeth established England as a Protestant kingdom, she saw the country well on the way to become mistress of the seas, and in her reign occurred the greatest burst of literary activity the world has seen since the days of ancient Greece

Elizabeth, the daughter of Henry VIII and

Anne Boleyn, was brought up under the cloud of her mother's execution and her father's dislike, she was finally recognized in his will as heir to the throne after her half-brother Edward and her half-sister Mary

During the Catholic reaction under the latter Elizabeth's known friendship for Protestants caused her to be thrown into the Tower, and she was charged with a plot against the unpopular Mary She survived this danger, however, and at the age of twenty-five, on the death of Mary, was summoned to the throne amidst the rejoicings of the Protestants and of many moderate Catholics

Elizabeth possessed rare natural qualities which had been sharpened by hard schooling in

the world of men and books In her puzzling and contradictory character may be seen her mother's vanity and uncertainties of temper, the caution and prudence of her grandfather, Henry VII, the pride and charm of manner that early made Henry VIII irresistible, and that lack of feeling that characterized all the Tudors

In her youth Elizabeth was striking and attractive Her figure was tall and well proportioned, she had a broad commanding brow, a fine olive tinted complexion, hazel eyes and a wealth of auburn hair She had also remarkable physical vigour, could hunt all day, dance or watch masques and pageants all night, and, when necessary, apply herself to official duties She was masculine in her coarseness of word and action, and carried stinginess to the extreme Carefully trained under the best teachers of the day, she spoke French with ease, knew a little Greek, and could speak with an ambassador in Latin if necessary She was an excellent musician, but cared little for literature or art

Elizabeth's first step as queen was to restore the reformed Church practically as it had been under Edward VI For the next thirty years, aided by well-chosen counsellors, she struggled to maintain England's independence from foreign control, and to settle the religious differences that split the nation While everybody was compelled to attend the services of her "Established Church" or pay a fine, Elizabeth made it as easy as possible for both moderate Catholics and Protestants to attend her Church without offending their consciences

## ELIZABETH

Yet a large Catholic party in England was plotting to put Mary Queen of Scots on the throne in place of Elizabeth. They sought the aid of the Pope, the Jesuits, France and Spain. Elizabeth strove to hinder these plans by elaborately pretending that she was going to marry either the king of Spain or some French prince. To make trouble for her enemies, she aided the Protestant Netherlands when they revolted from Spain, and also helped the Scots when they went over to the Protestant cause.



**GLORIANA' OF ENGLAND**

This portrait of Queen Elizabeth shows her in later life, at the height of her power. In her right hand she holds the Tudor rose and her elaborate gown and head-dress are studded with gems. This portrait, by an unknown artist, is in the National Portrait Gallery, London.

As a result of this change in Scotland, Mary Queen of Scots was compelled to flee across the English border where she fell into the hands of Elizabeth's officials (1568). Elizabeth's advisers urged her to have her rival executed in order to safeguard her own position. Not until 20 years had passed, and the King of Spain was gathering a great fleet to invade England, did Elizabeth yield to this advice and sign the death-warrant of the Scottish queen on the ground of a plot against her life.

Now took place the most glorious event in Elizabeth's reign, the defeat of the Spanish Armada (1588). All England gathered itself to meet the foe. Yet Elizabeth was the last to believe that the Armada was coming, and was so mean in fitting out and provisioning the English Navy as almost to risk defeat and prevent the victory from being as complete as it was. The real credit for the Armada's defeat is due to the skill and courage of the great English admirals of the time and the gifts of English merchants. (See Armada, Spanish)

But by this victory England freed herself from the fear of a Catholic reaction, and entered upon her great career of sea-power and colonization. The Englishmen of that day felt a new sense of power which found expression in the writings of a group of brilliant men whose works have shed undying glory on the reign of Elizabeth. Supreme among these was Shakespeare. In his verses the new pride in and love for England are finely expressed—

This roval throne of Kings, this sceptred Isle,  
This earth of majesty, this seat of Mars,  
This other Eden, demi paradise,  
This fortress built by Nature for herself  
Against infection and the hand of war,  
This happy breed of men, this little world,  
This precious stone set in the silver sea,  
This blessed plot, this earth, this realm, this  
England

Exploration and commerce had much to do with the making of England's supremacy at sea. The country ceased to be insular, looked outward and beyond, and a rosy optimism seemed to develop in the race as never before. "The searching and unsatisfying spirits of the English, to the great glory of our Nation," writes Stow, "could not be contained within the bankes of the Mediterranean or Levant seas, but they passed far toward both the Arctieke and the Antartieke Poles, enlarging their trade into the West and East Indies."

Elizabeth early set about adding to her naval force, and all through the forty-five years of her reign adventurers assisted her with their private vessels.

They were, in a word, pirates, even though their owners or other folk interested in them were highly respected members of society. There may have been patriotic reasons, but the chief motive seems to have been profit. In some of the expeditions not officially undertaken to punish her enemies, the sovereign was not above having a financial interest, and when Elizabeth invested money she always expected, and usually got, a handsome return. Thus we find ships belonging to the Navy



#### WHEN QUEEN ELIZABETH LAY DYING

In this picture, now in the Louvre, Paris, a famous French artist, Paul Delaroche, has painted the scene in Richmond Palace when Queen Elizabeth lay dying. She was taken ill at the end of February, 1603, and on March 15 her condition rapidly became worse. She refused all medicine and would not take to her bed. She lay on a pile of cushions on the floor with the Lords of the Council waiting by, and they remained in attendance until death came peacefully on March 24.

taking part in the shameful but profitable expeditions of Sir John Hawkins.

The disastrous expedition to the West Indies which sailed in 1594 with the object of seizing Spanish gold, is another case in point. Of the twenty-six vessels which took part in it only half a dozen belonged to the Queen. The remainder of the fleet were the property of private adventurers.

Perhaps nothing in the sea history of the period better reveals the grasping character of the shrewd woman who presided over the destinies of England than an incident which took place in 1592. Some ships owned by the Earl of Cumberland, a seaman of ripe experience with a liking for expeditions, fitted out at his expense, together with others belonging to Raleigh and the Hawkins family, fell in with the Portuguese ship *Madre de Dios*. Unfortunately, a little naval vessel which the enemy ship could have "swallowed" happened to be present, and Elizabeth claimed and secured the greater part of the profit made from the sale of the rich East Indian cargo.

It is stated that the wonderful array of silks, spices, carpets, and other goods captured so aroused the enthusiasm of the London merchants who saw them that the prize had no little influence on the formation of the East India Company that laid the foundations of our Indian Empire. (See *British Empire*)

Though Elizabeth never married, her suitors were numerous, and she kept them dancing attendance until she was an old woman. Perhaps her heart was most deeply touched by Robert Dudley, Earl of Leicester, Master of the Horse, handsome and clever, husband of the ill-fated Amy Robsart. Her next favourite was the equally ill-fated Earl of Essex, whom Elizabeth alternately loved and scolded, seeming to care for him much as a mother cares for a spoiled child. Yet, when he was condemned for armed rebellion, Elizabeth forced herself to sign his death-warrant.

Motives of state policy, the dislike of her imperious nature to give herself a master, and perhaps a certain coldness of temperament account for her refusal to heed the wishes of her people to take a husband. It is to be noted to her credit that she did not permit her personal favourites to influence her action in matters of state, but consistently followed the advice of chosen and intelligent ministers.

The religious question, the defeat of the Armada, and the flourishing of literature are the things we think of chiefly as marking the reign of Elizabeth. Not less memorable, however, are the hundreds of important laws—on shipping and commerce, roads and industry, poor relief and agriculture—which shaped the policy of England for more than two centuries after she and her advisers were in their graves,





### QUEEN ELIZABETH PAYS A STATE VISIT

Here is a contemporary artist's impression of the scene when Queen Elizabeth set out, seated on her 'carrying throne,' and surrounded by her court, to visit the home of her cousin Lord Hunsdon. Hunsdon is himself carrying the Sword of State before the Queen and in front of him goes her wise old counsellor, Lord Burghley, with, before him, Lord Howard of Effingham, the Admiral. Behind the throne are several Yeomen of the Guard, wearing the 'Beefeater' costume still familiar to us but without their hats.

In fact, the reign of Elizabeth marked the passing of the main features of the Middle Ages and the birth of modern England.

Elizabeth's vanity, her fondness for dress, her love of flattery and attention often made her appear ridiculous in her old age, yet she was ruler of England to the last. Not the least of her achievements was the fact that at her death she aided the peaceful accession of her relative, the Scottish king, the Protestant son of Mary, Queen of Scots, who became James I of England, and so brought about the permanent union of England with Scotland.

Even while Elizabeth was lying on her death bed in Richmond Palace, many of her courtiers were in constant correspondence with James VI of Scotland. Immediately her death took place, Robert Carey, who later became the Earl of Monmouth, received notice of the event from his sister, Lady Scrope, by the dropping of a sapphire ring, a signal that had previously been agreed upon. Carey at once set off to Scotland, to be the first to give the news to James. Three hours later it was decided to proclaim the Scottish king James I of England.

**Elizabeth, QUEEN CONSORT** (born 1900) Gracious charm, gentleness, an extraordinary power of putting others at ease, a kindly look—these are a few of the items that go to make up the winning personality of Queen Elizabeth. Her world-famous smile—never mechanical, always spontaneous—gained her the name of the "Smiling Duchess"; she will go down in history as the "Smiling Queen."

Elizabeth Angela Marguerite Bowes Lyon was born at St. Paul's Walden Bury, near Welwyn, Herts, August 4, 1900, the youngest daughter of the Earl of Strathmore. On her father's side she traces her descent to Sir John Lyon of Forteviot, who in 1372 married Lady Jean Stuart, daughter of King Robert II of Scotland, and received from the King the thanage of Glamis, which has remained in the family ever since. On her mother's side she descends from Elizabeth of York, daughter of Edward IV and consort of Henry VII. (See also Royal Family.)

As a girl she lived chiefly at St. Paul's Walden Bury, though for three months in each year the family migrated to Glamis Castle, and there were occasional visits to Streatlam Castle in

## ELIZABETH DOOMS MARY QUEEN OF SCOTS



Two dramatic episodes which will always be remembered in English history occurred during Queen Elizabeth's reign of 45 years—the defeat of the Spanish Armada and the execution of Mary Queen of Scots. Mary had been held in captivity in England for 18 years, but after the Babington plot she was put on her trial and sentenced to death. Elizabeth hesitated to sign the death-warrant, and here an artist has shown the scene when Lord Burghley at last persuaded her to put her name to the document.

*Painting by Julius Schröder*

## ELIZABETH

Durham, another of her father's seats, and to London. During the World War Glamis was used as a hospital, and her radiant presence did much to cheer the wounded men. In 1923 she was betrothed to the Duke of York (afterwards King George VI), the wedding taking place in April of that year. A daughter, Princess Elizabeth, was born in London, April 21, 1926, and a second daughter, Princess Margaret Rose, on August 21, 1930, the first member of the Royal Family to be born in Scotland since the birth of Charles I.

As Duchess of York, Queen Elizabeth became widely known to the country by the performance of many public duties. In 1927 she accompanied

her husband on an extensive Dominion tour, which culminated in the opening of the Commonwealth Houses of Parliament at Canberra. She was crowned Queen Consort in Westminster Abbey on May 12, 1937.

From her teens Queen Elizabeth has taken a keen interest in the Girl Guides, and to this interest has been added a multiplicity of others.

There is scarcely a charity or a movement for the betterment of the conditions of life of women and children that has not received her encouragement, and when the Queen gives her countenance to any organization it always means that she knows a great deal—not only about its objects, but also about the way in which it seeks to

attain those objects, for she is, above all things, practical and thorough in all her doings.

Indeed, by a happy combination of temperament and character, the woman who was once Lady Elizabeth Bowes-Lyon and then Duchess of York, has shown herself to be perfectly fitted to fulfil the difficult role of Queen Consort in a democratic country.

**Elizabeth and Margaret, PRINCESSES** The elder daughter of King George VI and Queen Elizabeth was born at 17, Bruton Street, the London residence of the Earl and Countess of Strathmore, the Queen's father and mother, on April 21, 1926, and was christened Elizabeth Alexandra Mary. The Princess is heir presumptive, not heir apparent, to the throne, which means that if a son were born to the King and Queen he would succeed to the throne before Princess Elizabeth.

Princess Margaret Rose, the younger daughter of the King and Queen, was born at Glamis Castle, the Scottish seat of the Earl and Countess of Strathmore, on August 21, 1930. Both Princesses have accompanied their parents on many public occasions, such as the Royal garden parties at Buckingham Palace. They drove with them to the thanksgiving service for the Silver Jubilee of their grandfather King George V in St. Paul's Cathedral.

They sat beside Queen Mary two years later at the Coronation of the King and Queen, wearing miniature robes and coronets, and intently watching the great ceremony.



**THE PRINCESSES WITH THEIR MOTHER AND FATHER**

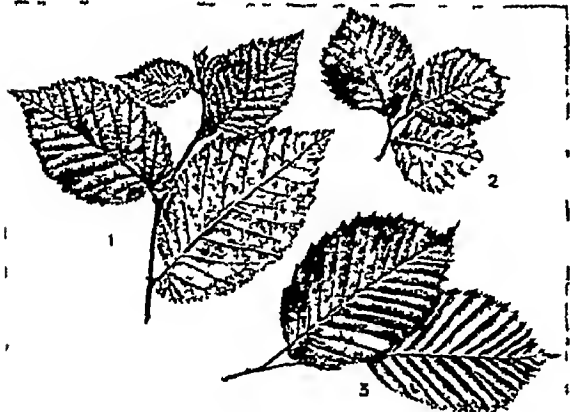
Princess Elizabeth and Princess Margaret Rose have been brought up simply with lessons occupying a large part of their time. The winning smile of their mother Queen Elizabeth has captured the hearts of all who have seen her and her grace and charm are evident on all her public appearances. Our photograph of the family group was taken at Windsor on the occasion of Princess Elizabeth's fourteenth birthday.

Photo A.P.U.

In the autumn of 1937 Princess Elizabeth became a Girl Guide and Princess Margaret a Brownie in a special troop of Girl Guides formed among their friends

**Elm.** Most people think of only two kinds of elm in Britain, the common elm (*Ulmus campestris*) and the wych elm (*Ulmus montana*), but actually there are more than half a dozen distinct species growing wild in our country, as well as innumerable hybrids and introduced forms in parks and gardens. But it is by no means easy to distinguish the species.

The common elm has quite small, broad leaves, rough above and downy along the veins below, those of the true wych elm are very rough above and large, with prominent veins. In very lusty saplings they often have two subsidiary points, one on either side of the main apex. Then there are the smooth-leaved elm (*U. nitens*), whose leaves are usually narrower in proportion to their length than those of other species, and smooth, often shining, above, the Cornish elm, native in the south-west of England, a tall, almost columnar, small-leaved type, the Wheatley elm, narrow and pyramidal, and ideally suited for town-planting without ever needing pruning, and the Dutch elm, with large, broad, coarse leaves, the bark of its twigs often being corky. Among less common varieties are the cork elms, whose shoots have prominent "wings" of cork.



It is a curious fact that the English elm, although probably native, never now sets seed in Britain, and therefore spreads itself by suckers, the true wych elm, however, sets seed very freely—as you may often see in the north, where this tree is common—and it has no suckers. The fruits, called samaras, are oval, the actual seed being in the middle of the surrounding wing, in great brown bunches, they are very conspicuous in early summer.

Elm wood is tough, strong and durable, when kept permanently wet or permanently dry, it is the favourite wood for coffins, and is sometimes used for furniture. The modern seasoning system known as reconditioning



THE ELM AND ITS LEAVES

Here is a really fine, stately elm tree, with that typical umbrella-like head and huge, single trunk which is so characteristic of this tree. The picture on the left shows some leaves (1) of the wych elm, and (2) of the English elm (3) Leaves of the hornbeam, sometimes confused with the elm. Photos H. Bastin. British Museum (Natural History).

renders it suitable even for panelling, but it is otherwise inclined to warp badly. Many insects live on the elm trees, such as the large tortoise-shell butterfly and the elm bark beetles (*Scolytus*), which carry the dreaded elm disease.

**Ely, ISLE OF** This administrative county of England lies within the geographical county of Cambridge and has an area of 372 sq miles and a population of over 77,000. Ely, the best-known town, is a cathedral city standing on the left bank of the Ouse, 15 miles north of Cambridge. More than 950 years ago the Benedictine abbey that replaced the 7th-century monastery founded by Etheldreda was the refuge for some time of Hereward the Wake, who had continued to resist the Normans.

Etheldreda's monastery housed both monks and nuns, and stood till 870, when the Danes destroyed it. Hereward's "refuge" was founded a century later, and at the end of another hundred years the magnificent cathedral was begun by Abbot Simeon.

This beautiful church, a cruciform building 537 feet long and 180 feet across the grand tran-

septs, has been added to at various times since it became the cathedral in 1109. The nave and west front were added in 1189, the choir dates from the 14th century, when the octagon tower and lantern were also built out of the remains of the tower, which fell in 1321. The Lady Chapel was finished in 1349. The bishop's palace is a picturesque building, and the city has some interesting old houses. Population, 8,300.

**Embroidery.** The art of ornamenting fabrics with needlework is called embroidery. Most ancient nations apparently knew how to embroider, and some of their work has been preserved to this day. The sandy soil and dry climate of Egypt have preserved examples of embroidery which were worked more than 3,500 years ago, the earliest of these are now in the Cairo Museum. Some of the early Egyptian embroidery was worked on leather, such as gazelle, in a form of mosaic. This work on leather has also been found among the primitive tribes of Central America.



#### AN EXAMPLE OF CROSS-STITCH EMBROIDERY

Linen embroidered in cross-stitch can be used for many beautiful and useful articles in the household. Old embroideries of this kind were worked on very fine linen, but modern work is done on specially woven cloth with rounded threads. The illustration shows a border design in colours worked in cross-stitch on white linen.

The ancient Greeks practised embroidery, and the Romans termed the art "painting with the needle", many famous Roman writers allude to the embroideries on tunics and other garments. Strangely enough, no examples have been found near Rome, though embroideries found elsewhere, especially in Egypt, show evidence of the Roman influence.

The people of the Orient excel in embroidery today as they did centuries ago. In China and in Kashmir the art has suffered little change in either style or design. The delicacy of workmanship and gradation of colouring, particularly of the Chinese work, are exquisite. The embroidery of Japan is similar in character to that of China, but the stitches are generally more loosely worked, and are more fanciful. In working a scene, stitchery is frequently allied to painting to secure variety in the effect. Persian work has been confined chiefly to the

decoration of hangings and to carpets (particularly prayer rugs).

With the advent of the Christian era the art of embroidery in Europe began to change in design, and to a great extent was influenced by religion. Even on garments scenes from the Gospels were depicted. Naturally church vestments and hangings were embroidered, some of the early ecclesiastical work is still preserved and provides, in some cases, a pictorial contemporary history. Women of the upper classes were wont to spend much of their time in embroidery, especially in working tapestries.

One of the most famous pieces of needlework of the Middle Ages, which pictures the life and dress of those far-off times, is that known as the Bayeux Tapestry (*qv*), a band of linen more than 230 feet long, which contains 72 scenes, embroidered in coloured wools, telling the story of the Norman Conquest.

From about the end of the 12th century distinct national styles began to develop. In most

cases the embroidery on domestic articles has not survived, so that the history of the art has been chiefly traced in the wonderful examples of church embroidery which have withstood the ravages of time. In England embroidery has been a favourite way of occupying leisure hours among persons of all ranks for many centuries. In the 13th century English embroidery was noted throughout Western Europe,

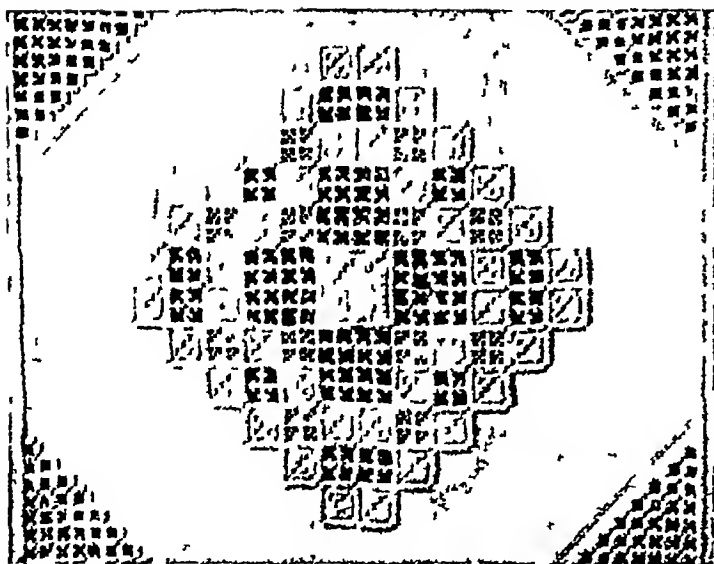
and about that period it was at its best.

During the Tudor period the garments of the rich were lavishly embroidered in silks and in gold thread. About this time a variety of embroidery known as "black work" was popular, it was done in black silk on linen of white or natural colour. Another kind of work of the period was done in wools and silks on an open mesh material, closely worked and completely covered with embroidery. This work is called "petit-point," the name given to it in France, by which it has ever since been known. Petit-point work was used for hanging tapestries, screens, chair and stool seats, etc. French embroidery is significant for the grace of its design, much of it being a combination of floral and scroll forms.

In the Netherlands, the various schools of painting influenced the embroiderer's art, it seems evident that, for some of the larger



## EMBROIDERY

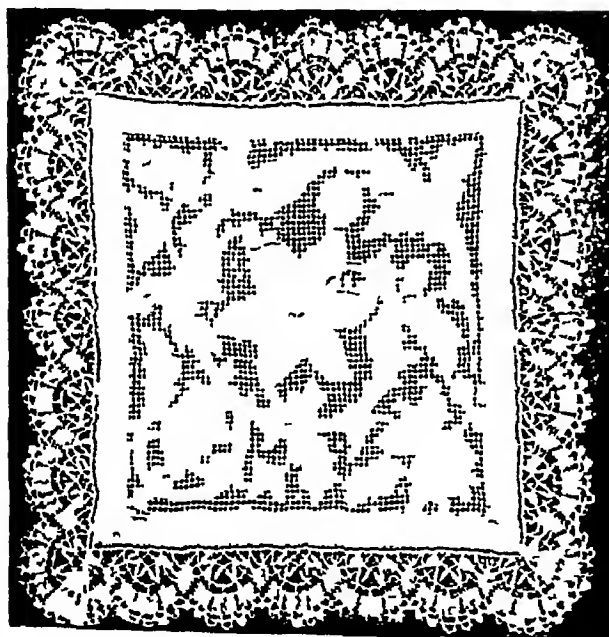
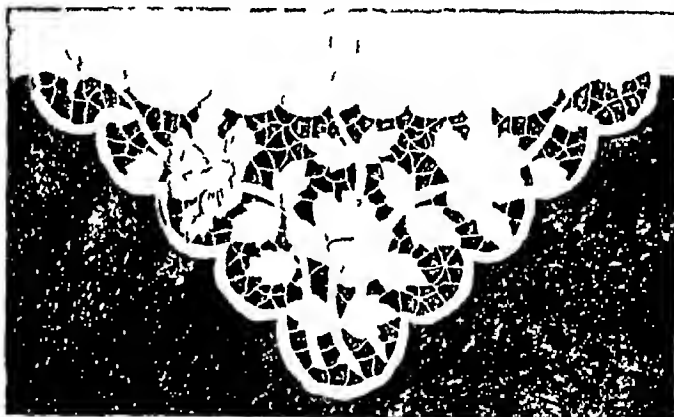


In Germany, during the 13th and 14th centuries, some fine pieces of ecclesiastical embroidery were worked, depicting figures of saints. The treatment of the costumes on these figures was often somewhat unusual, being worked in patterns giving a flat effect. A great deal of the later German work was floral in design and rather bold. Many of the characteristics of the German people are evident in the wonderful embroidery of their peasant costume. The custom of wearing the national costume for special occasions, particularly for weddings, still survives in many parts of Germany.

In quite a number of European countries embroidery is still practised among nearly all classes in their leisure

tapestries, painters were commissioned to create designs for the embroiderers.

Hungarian, Rumanian, and Swiss peasant embroideries are famous, and are usually on fine muslin or linen, in bright and bold colourings. The Armenian embroideries are fine and colourful peasant work. Smocking and drawn-thread work are often features of peasant embroidery. Some of the finest smocking is to be seen in the specimens of English embroidery of the 18th and 19th centuries, and the various stitches are still copied extensively.



### THREE KINDS OF EMBROIDERY

The top photograph shows a design for a table runner in Hardanger work on loosely-woven linen. The beautiful design in the centre is executed in Renaissance work, which relies on buttonholed bars to emphasize the design. The bottom illustration is a linen table-mat embroidered in punch work.

hours, and the stitchery is often very carefully and accurately done. The Royal School of Needlework, Kensington, has fostered the recent revival of art needlework in England, and was responsible for the execution of embroideries on some of the Coronation robes.

Royalty has long been associated with beautiful needlework. Mary Queen of Scots, during the long years of her imprisonment, did some wonderful pieces of embroidery, which were presented to Queen Elizabeth in order to enlist her favour. Elizabeth herself was an enthusiastic needlewoman. Queen Mary is an expert needlewoman and a connoisseur of embroideries. The Princess Royal and her husband, the Earl of Harewood, undertook a set of three dozen chair seats, each with a different design of an English game bird, for the Long Gallery at Harewood.

Styles of embroidery often copied today are as follows. Broderie Anglaise, though chiefly characterized by eyelet work, both rounds and ovals, is often composed partly of solid stitches to suit the design. Real Madeira work consists of circular eyelets worked in groups.

Renaissance work has the outlines of a design in buttonholing, and the pieces connected with





### FROG EMBRYOS ARE EASILY SEEN

Here are two masses of frog spawn, that on the right being in a further state of development than the other. In both, the tiny embryos are visible within the mass of jelly, on the right, in fact, you can see that they are already taking on the shape of the tadpoles which they will soon become.

ment consisted in the expansion or growth of this animal in miniature.

Then K. E. von Baer (1792-1876), the father of modern embryology, showed that all the tissues and organs come from cell-layers, or germ-layers. One layer gives rise to nerves, another to skin or feathers or fur, and a third splits and from it come the internal organs, bones, etc. This is the germ-layer theory.

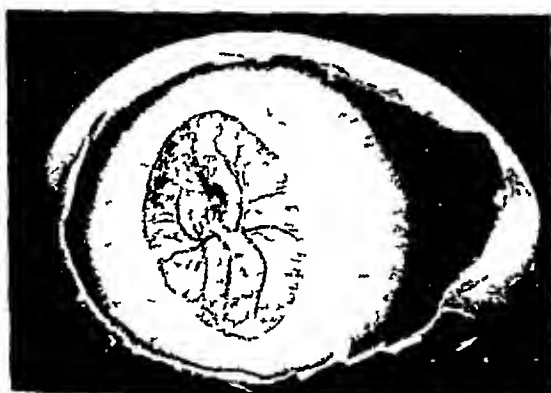
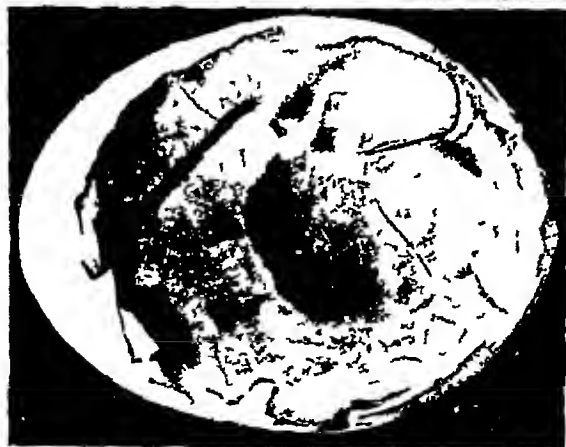
Other scientists broke down the rigid line that was supposed to separate vertebrate and invertebrate animals (those with backbones and those without), and indicated how higher types had been developed from simpler ones. The chick, and for that matter Man himself, in the embryo has gill clefts like a fish. These disappear, but they give clues pointing to the time when perhaps both were water-breathers. Thus embryology retraces life's history, contributing important evidence in support of the belief that the higher animals have been

of South America, the Ural Mountains, and the Salzburg Alps.

In olden times the emerald was supposed to possess magical qualities—it drove away

evolved from the simpler ones (See Evolution).

**Emerald.** This is among the oldest of precious stones, being known to the Egyptians as early as 1650 B.C. Emerald mines were worked for Alexander the Great by Greek miners, while Cleopatra also obtained supplies of these jewels. The Spaniards took large quantities from the Peruvians after their conquest of South America, but the position of the mines was kept a close secret, and has never since been discovered. At the present time the chief sources of supply are parts



### THREE STAGES IN THE EMBRYOLOGY OF THE YOUNG CHICK

Unlike the frog, the chick is well nigh fully developed when it hatches from the egg and here we are shown what goes on inside the egg before it is hatched. The top photograph shows a newly-laid egg, with the embryo just forming on the surface of the yolk. On the left below we can see the blood-vessels, already spreading on either side of the heart—which all-important organ is the first to be formed. Finally, the chick on the right below is well formed, a leg is visible at the top of the picture while the rest of the creature is curled neatly round.



evil spirits, and cured such diseases as epilepsy and dysentery, but now the superstition that green is unlucky deters many people from wearing these stones. Emeralds have even been taken powdered as a medicine to cure illness.

**Emerson, RALPH WALDO (1803-1882)** Emerson ranks as the most powerful and profound of American thinkers, and he is still powerful in that his thoughts stir vigorous movement in the minds of his readers. He is not among the most widely read authors, but he has been a strong influence in moulding the ideas of the past hundred years. Some of the keenest and best minds in both the Old World and the New have accounted his message of resolute self-reliance as one of the cardinal factors that shaped their lives and thinking.

Emerson's ancestors were Puritans who went to New England in 1635. Eight of his ancestors were ministers of New England churches. His father died when the boy was eight years of age, leaving the family poor. Emerson went to Harvard in 1817, and on leaving college taught in his brother's school and then entered the Unitarian ministry.

#### First Years of Obscurity

Through all his early years Emerson had been a quiet, unobtrusive, self-contained person. For the first thirty years of his life he seemed destined to follow peacefully in the footsteps of his ministerial ancestry. But underneath the quiet exterior was a steadily growing resolve which was to separate him from the Church, and he resigned his position as minister.

For a time he did not find himself. His young wife died in 1832, and Emerson's health broke down. He went to Europe, and visited England. There he met most of the great men of letters of the day: Landor, Coleridge, John Stuart Mill, and, above all, Carlyle, whom he admired more than any. But it is curious that travel and great men meant but little to Emerson. "The difference between landscape and landscape is small," he avowed. As for the men, they seemed to him inferior in intellect, except Carlyle, with whom he formed a lifelong friendship.

To understand Emerson's aloofness from men and events one must grasp his way of thinking. He believed that great truths come to us by intuition—that is, that they come to us unbidden. Furious striving avails us nothing; truth comes gently and unawares. Most modern philosophers do not agree with Emerson; they think that truth may be reasoned out. Besides, they are interested in the working out of truth in relation to human life, while Emerson was always on the alert for the first dawning. He never finishes, but is always beginning, and his beginnings have been inspirations to the people of two continents.

"God is in every man." This phrase is the keynote of what is called the "transcendental movement," or that faith in the "inner light" of which Emerson was the chief exponent.

In the matter of style Emerson stands supreme for his power of saying much in little, of so phrasing his thoughts that they sparkle and glow. Every sentence seems as good as the one it follows. This is true of his poetry as well as his prose—that is, the power of stating truth in sharp relief.

Emerson has been criticized for the lack of organization or plan in his essays. But we must remember that he never tried to put plan there. One might say that he was too honest. He said what he had to say, as it came to him.

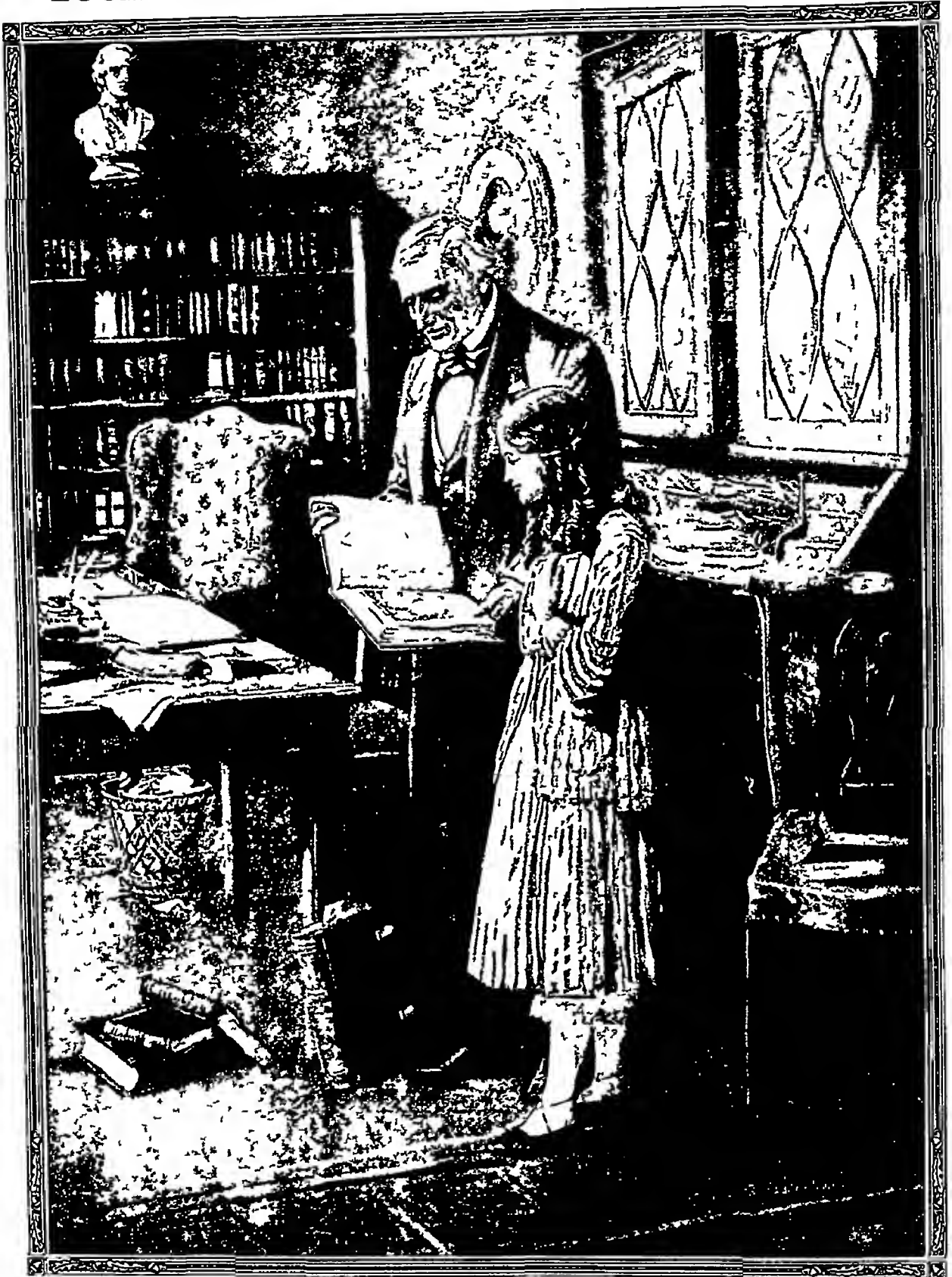
He began writing for "The Dial" in 1840 and edited it for two years; this magazine came to be regarded as the special organ of the New England Transcendental movement. The first series of those "Essays" by which he was to become most widely famous was published in 1841, and a second series followed three years later. In the autumn of 1846 he revisited England on a lecturing tour, delivering a series of addresses on "Representative Men"—Plato, Swedenborg, Montaigne, Shakespeare, Napoleon, and Goethe. The volume containing these addresses was published in 1850. In 1856 the fruits of his observation during his stay in England were embodied in that admirable, and on the whole acutely discriminating, volume "English Traits." As writer and lecturer he came to take his position as the chief leader of American thought of his generation. His successive works, including "Society and Solitude" (1870) and "Letters and Social Aims" (1876), met with the same cordial welcome on both sides of the Atlantic.

Emerson married a second time in 1835, and when his home—the Old Manse, at Concord, Massachusetts—was burned down in 1872, a popular subscription was made and the funds used to rebuild it. He died on April 27, 1882, and was buried in the famous cemetery of Sleepy Hollow near by.

**Emery.** In outward appearance emery has nothing in common with the sapphire and other precious stones to which it is related. It is a dense, opaque, dull substance, like a fine grained iron ore, ranging in colour from reddish brown and grey to blue black. It is found in large boulder like masses in Asia Minor and on Naxos and other islands of the Grecian archipelago.

The rock is made ready for use by breaking it into lumps and crushing these to powder in stamping mills. It is then sifted to various degrees of fineness. As emery is one of the hardest natural substances the powder is used for cutting and polishing many kinds of stone. Glass stoppers are ground into their fittings.

## LUCKY GIRL—WITH EMERSON FOR A FRIEND!



Of course you know this is Ralph Waldo Emerson, and you can see that he is showing books to the young girl but who do you suppose that girl is? She is Louisa May Alcott, author of "Little Women"! When she was a little girl, living there in Concord, she used to be a regular visitor at the home of the Emersons, and she spent many happy hours with the great man, who used to go about with her among the books and help her pick out the ones he thought she would like best and that it would do her the most good to read. The scene is typical of the many happy gatherings in Emerson's home, for it was a famous meeting place for writers, philosophers, and other notable figures from all parts of the country.



clenches his fist and suddenly attacks the referee—all these are under the influence of emotional states. All such emotions involve unusual excitement and give rise to actions which are more or less unplanned, or irrational.

Everyone is familiar with the outward physical signs of emotion. The person in a sharp attack of anxiety breaks out into perspiration. The angry person reddens and then turns pale. The frightened child trembles. At the same time disturbances are taking place within the body. The blood pressure rises, the pulse beats faster, breathing is more rapid and disordered, the normal processes of digestion are halted, even the supply of blood has been directed from the stomach and towards the trunk muscles and into the arms and legs. The adrenal, or suprarenal, glands, which sit like tiny cocked hats on top of each kidney, pour an increased supply of adrenalin into the blood. This speeds the heart beats, changes the chemical composition of the blood, diminishes the poisons caused by fatigue, and increases the rate at which blood clots.

#### When We Get 'Worked Up'

We can easily see the usefulness of these reactions in certain situations. The changes in breathing, blood pressure, and pulse rate are of great assistance to the man who faces sudden danger and must fight for his life or seek escape. The adrenal glands, working at high speed, prevent his feeling fatigue, and if he should happen to be wounded, the prompt clotting of the blood helps the injury to heal. Emotion, then, may be regarded as Nature's way of equipping us to meet emergencies.

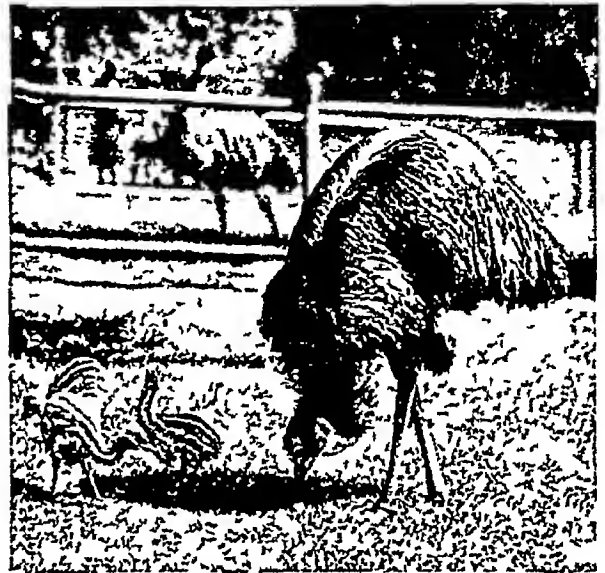
In calmer times, too, emotion plays its valuable part in enriching life. Our friendships, our enjoyment of music or poetry or trees or flowers are, in large measure, emotional. Our love of country, or loyalty to school or football team, have a strong emotional quality. The desire to achieve great things is closely related to emotion. During intense excitement we sometimes have "inspired strength," and can accomplish things we had not thought possible.

But emotions have their unfortunate aspects, too. Though emotion aids the man who must fight or run for his life, in modern civilization most problems cannot be met by fighting or running away, but must be solved by calm reason. And clear thinking is hindered by emotional stress, it is doubly hard to reason calmly when we are stricken with fear. Again, each strong emotion seeks expression in physical activity, such as fighting when we are angry, and running when we are frightened. Denied these outlets, they may become physically harmful.

Emotions are sometimes organized into patterns called "complexes," which may cause great difficulty. A common type of complex is the "phobia," or abnormal fear, such as the fear

of high places, open spaces (agoraphobia), or close rooms or tunnels (claustrophobia), or of certain kinds of animals. Emotions which have been allowed to drift into wrong channels may find expression in the form of temper tantrums, irritability, needless worry, or extreme shyness. Psycho-analysts believe that many forms of mental disturbance are due to repressed emotional complexes. (See Psycho analysis)

**Emu.** (Pron ē'-mu) Closely related to the cassowary, this running bird lives on the plains of Australia and is a member of the *Ratitae*, or flightless birds, its scientific name being *Dromaeus novaehollandiae*. The emus have no cap or helmet such as the cassowaries wear, and are really more likely to remind you of the ostrich



#### MOTHER EMU AND FAMILY

In a continent which has such unusual birds as black swans and white eagles, to say nothing of 60 different kinds of parrots, we are not surprised to find huge birds that cannot fly at all. This emu family is in captivity.

*Australian National Travel Association*

than of anything else. But the plumage is heavy and dull brown in colour, and has no ornamental value. The bird stands about five feet high, ranking next to the ostrich in size. Its food is exclusively vegetable, consisting of fruits, roots, and herbage. It may be tamed, and breeds easily in captivity. It lays 9 to 13 dark green or bluish eggs, nearly as large as ostrich eggs, in a cavity scooped in sandy soil.

**Enamel** AND ENAMELLING. The extraordinarily delicate examples of "cloisonné" ware in the jeweller's window, the beautiful glazed decoration of cups, plates, and vases carefully preserved in museums, much of the dazzling white equipment of our bathrooms, granite ware, the shining blue and white kitchen-ware, and the dials of our watches, are all examples of the art of enamelling.

Enamelling means coating a base of metal, pottery, or other mineral substance with finely



## WHAT SKILLED ARTISTS CAN DO WITH ENAMEL



The three specimens of enamel ware above show the many possibilities for varieties of beauty which may be obtained by this process—pictures, complex lines and figures and ornamented flat surfaces. The platter is a beautiful treatment of 'The Last Supper', done in painted enamel on a copper base, by the French artist, Jean Reymond, in the second half of the 16th century. The jar is a modern specimen of Japanese cloisonné work, while the wine pot with the handle is of enamelled copper. The dish and the wine pot are in the South Kensington Museum, London, and the jar in the Metropolitan Museum of Art in New York.

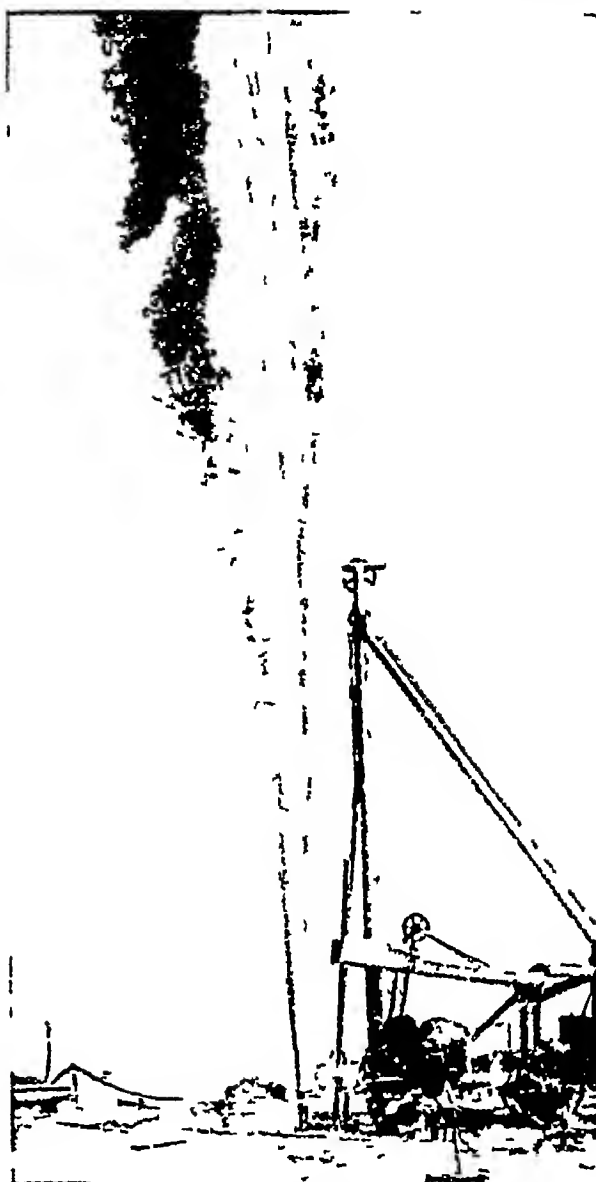
Each manufacturer guards the secret of his ingredients with many precautions. The chemicals are kept in separate bins and are always spoken of by number, never by name. The weighing is done on scales so adjusted that only the person in charge of the work can see them.

After the ingredients are carefully mixed, the "melt" is made in a blast-furnace. When the heat has changed them into shining molten glass, a plug is drawn and the vitreous liquid falls hissing into a tank of cold water. With explosive violence the whole mass is torn into shreds and the shreds are cracked into innumerable fissures. This "quenching" toughens the enamel body and makes easier the grinding, which is the next process. During the grinding colouring matter is added.

When the whole mass has been reduced to a very fine powder, it is mixed with water and a little ball of clay, and then it is ready to apply. The operator dips the cleaned metal vessel into the liquid enamel, or "frit" as it is called, covering every part, and then places it on three metal points to dry before it is taken to the furnace room, where it is fired. From two to four coats of enamel are usually applied.

**Encyclopedia.** In form this book is an encyclopedia, as it covers subjects from A to Z. Not until the 18th century was the alphabetically-arranged book of general knowledge given the name of encyclopedia (the "e" spelling is preferable to the diphthong "æ"). An important early work was the "Cyclopaedia, or Universal Dictionary of Arts and Sciences" of Ephraim Chambers (d. 1740), and it was a translation of this that formed the basis of Diderot and D'Alembert's famous "Encyclopédie" (published 1751-72). This vast compilation consisted of 33 volumes, including supplements and plates, and its expression of political opinions aroused much controversy in contemporary France. The first edition of the "Encyclopædia Britannica," published in Edinburgh about the same time, was a compromise between the alphabetical and scientific arrangement of subjects. Other famous English encyclopedias are Chambers's and Hammerton's "Universal." The greatest names among modern Continental encyclopedia-makers are, perhaps, Larousse in France and Meyer in Germany.

**Energy.** Like the "Philosopher's Stone" that plagued the imagination and inspired the labours of the medieval alchemists, the idea of a perpetual-motion machine—a device which continues to run itself without fuel or other outside aid, and yet is able to do work—has for centuries challenged the inventive genius of bright young scientists. Thousands of machines of this kind have been proposed. One of the simplest is a water-wheel run by water from a pump, the pump itself being



Arystone

#### ENERGY FROM AN OIL WELL

When a new oil-field is tapped the oil spurts up into the air until it can be harnessed to be used as fuel. Here in the oil fields of Oklahoma State, a newly found 'gusher' sends its potential energy high into the air.

driven by the water wheel, and, in addition to the wheel running itself, the inventors of this machine planned to put a pulley and belt on the axle so as to run a mill of some kind.

No such device has ever worked, although hundreds and hundreds of gifted mechanics have wasted their time and energy in trying to develop one. Further, science tells us that it is against the known laws of Nature that such a device should work. Nature rules that you cannot get more work out of any device than you put into it. This law, stated in the more exact words of science, is called "the law of the conservation of energy."

Thus, a petrol engine will not run and do anything unless you supply it with petrol mixed with air, and this mixture of petrol and air is a form of energy. You must put work into the engine to get work out of it.



## ENERGY

Again, take the railway locomotive. First, the engine uses coal, which is stored-up energy, and turns it into heat energy by burning. The heat energy turns the water in the boiler into steam, a form of expansive energy. The engine turns this expansive energy into mechanical energy, which runs the engine. From beginning to end, the chain is unbroken. We have transformed one kind of energy into another, but at no time have we created any energy.

Neither, for that matter, have we lost energy. We did not get all the heat energy of the coal in the form of steam. Some of it warmed the air around the boiler, some went up the chimney. But it was not destroyed.

This example shows another important fact about energy. The whole chain started with coal, which is inert until we set fire to it. It was what science calls potential energy—energy ready to work but not yet working. When we burned the coal, we turned its potential energy into heat—that is, into kinetic, or active, energy. We can reverse the process, if we like, though not with coal. We can pump water into an elevated tank. Being there, it has potential energy, for it can do work whenever we let it down, and we used the kinetic energy of the pump to accomplish this.

What, then, can the engineer do with energy? All he can do is to devise machines for transforming energy. He cannot make a machine which will create energy. His greatest task is to study Nature's sources of energy, or stored-up work, so that he can transform them into useful work.

Of these sources, the most important are the chemical energy of coal and coal oil (petroleum) and, to a less extent, of wood, the energy of the water power of the rivers and streams, and the energy of the winds which drive wind-mills, sailing ships, etc. There are others, but we have not

learned to use them much. And of these the largest source of power for manufacture and transportation is still found in coal and oil. Stopping the coal-mines stops our industrial life.

But where does all this "stored-up work" which Nature provides for Man come from? Why do the rivers flow and furnish power year after year? And whence came the coal and coal oil? And what is the source of the energy of animals? Science tells us that the great source of energy on the earth for Man's use is and has been the sun. It is the sun that acts like a great pump to lift by evaporation the water into the clouds to fall as rain and snow, to keep up the flow of rivers. If the sun were to cease sending heat, the rivers would soon dry up, and we could have no water-power.

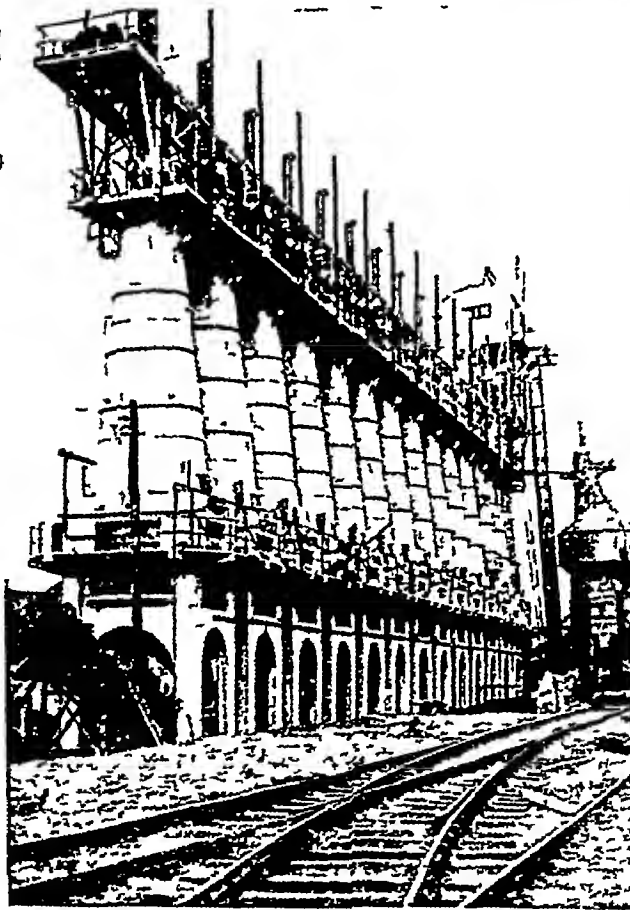
### Coal is Stored-up Sunshine

What about coal? Geology tells us that coal is simply the combustible part of trees and plants which grew ages ago on the earth and have been preserved as fuel. But this stored-up work of ancient plants came from the light and heat of the sun. Plants will not grow and wood will not form if there is no sunshine.

But what about the energy of animals—of men, horses and oxen? Here, again, we come back to the energy of sunshine, for animals cannot work without any food. Indeed, an animal is in a sense a machine for turning the chemical energy of food into muscular energy. But food for Man and beast finally depends upon plants, and plant energy is the transformed energy of sunlight. So all energy comes from the sun.

How does the sun get its energy? Some may come from meteors falling into the sun, and some from the sun's contraction. But science now believes that the greatest source of energy is the action of atoms within the sun.

Atoms and electrons give off energy by sending radiations through space, just as the end of a



### GETTING MORE ENERGY OUT OF COAL

These coal distillation works at Glenboig, Lanarkshire, are the largest in the world. As you see, they have fourteen retorts. This process of distillation, or "low-temperature carbonization" makes for greater efficiency and less waste of energy, for the by-products of coal include oil fuels and other sources of energy.



stick whirled rapidly in still water will send disturbances radiating over the surface. This process works the other way round, too. If you sent water waves against particles such as bits of cork, it would set them moving. So like wise heat, light, and other waves sent against electrons set them going faster. That is, the electrons *absorb* energy, which they give off in turn as light or heat, or perhaps as chemical action. (See Radiation)

Now comes a remarkable fact, only recently discovered. If you were transforming energy by heating iron until it gave off light you might think that the more you heated it, the more light it would give. This is not exactly true. Fine measurements show that, after it is glowing, the iron will absorb a certain amount of heat without giving off more light, then just a trifle more heat will make it give off considerably more light. It seems as though it has to absorb a definite quantity of energy before it can change at all. Then it changes all at once and emits the entire amount that it has absorbed.

#### The Quantum Theory of Energy

Scientists have measured this mysterious "unit quantity" of energy, called a *quantum*, and are discovering why matter behaves this way. They think that electrons do not absorb or give off energy while merely moving in their orbits, but only when they *jump* from one orbit to another, jumping to outer orbits when they absorb energy, and falling inward when they emit energy. The quantum is the amount needed to make one electron jump from one orbit to the next, or given off when it falls inward one orbit. (See Atom)

This wonderful story of the forces of Nature and the transformation and conservation of energy was worked out about 1840 by Joule, Helmholtz, Kelvin and other great scientists of that time. The quantum theory has been worked out since about 1900 by Planck, Bohr, Einstein, and others.

**Engineering.** The skilled engineer of today is not only a builder, he is an expert who can solve the most difficult economic and financial problems, and can forecast the future. Thus, an engineer planning a railway line can tell what route will yield the largest earnings through his knowledge of the effect of grade and curvature on the cost of haulage and other similar technical details.

Before work was started on the new Panama Canal—the greatest engineering achievement in history—engineers estimated that the cost of digging 100,000,000 cubic yards of rock from the Culebra cut would be 3s 4d a yard. When the canal was completed some 15 years later, it was found that they had overestimated by less than one penny a yard!

There are four principal divisions of engineering: civil, electrical, mechanical and mining engineering. "Civil engineering" comprises works in connexion with transportation, such as railways, canals and roads, works which have to do with water, such as public water supply, irrigation, drainage and sewerage, works of river and harbour improvement, and structural works, such as bridges, buildings, etc.

#### Electrical, Mechanical and Mining

"Electrical engineering" deals with the design, construction and application of electrical machinery and apparatus. "Mechanical engineering" is the art of machinery design and construction. Mechanical engineering so far underlies engineering of every class and all kinds of industrial operations that it can almost be said to sustain the whole fabric of modern civilization. "Mining engineering" includes work in mine exploration and development. Each of these divisions includes a large and increasing number of specialized lines, totalling 100 or more. Thus, civil engineering includes railway, hydraulic, structural, sanitary engineering, etc. Mechanical engineering includes steam, gas, motor car, heating and ventilating engineering, etc.

Other important branches are military engineering and marine engineering. "Marine engineering" embraces the building and operating of ships and naval accessories, the construction and planting of torpedoes and mines, etc. "Military engineering" includes the construction of fortifications, trenches, military bridges, pontoons, army telegraph and telephone systems, etc.

An engineer who gives advice as an expert on engineering work is termed a "consulting engineer." As a consulting engineer is frequently asked to advise on the work of other engineers, he is generally a man who has had considerable experience in his field.

#### Engineering as a Career

The term engineer is applied to the artisan as well as to the type of worker mentioned above. The former usually enters a works as an apprentice at the age of 15 or 16, from an elementary, secondary, or technical school, and one with previous technical training has the best chance of success. The "professional" engineer invariably has to undergo a long training at technical school and university, and to take his degree, before he can begin to practise. The "modern" universities grant degrees in engineering and the training is especially good at provincial universities and colleges—as at Sheffield, Liverpool, Hull, etc.—in industrial areas. The City and Guilds College, London, and the Royal Technical Schools at Glasgow and Salford, also prepare the engineer.

The artisan engineers' trade union is the Amalgamated Engineering Union (110, Peckham Road, London, S E 15).





# 'This BLESSED PLOT . . . this ENGLAND'

*To most of the readers of this book England is the Motherland, the land above all lands in their affection and esteem Yet how little we usually know of the England that lies beyond our own town and district!*

**England.** Though they may never put them into words, every native of England harbours such thoughts as those put into John of Gaunt's mouth by Shakespeare in his play "Richard II."

This other Eden, demi paradise,  
This fortress built by Nature for herself  
Against infection and the hand of war,  
This happy breed of men, this little world,  
This precious stone set in the silver sea  
Which serves it in the office of a wall  
This blessed plot, this earth, this realm,  
this England

The centuries have left their enduring mark on the land and its people in the form of age old

tower have tolled for generation after generation of true Englishmen, perchance they gave warning of the Spaniards' coming in their great Armada. The recess beside the altar speaks eloquently of a primitive rite, a more ancient Church. The brasses upon the chancel floor show knights clad in armour such as the Crusaders wore, and dames in stately steeple-hats. Upon the walls a Tudor squire and his lady, beruffled in starched magnificence, kneel to pray surrounded by a goodly quiverful of boys and girls they had given to the State. From this pulpit all the winds of theological



**EVENSONG IN AN ENGLISH VILLAGE CHURCH**

Many of the village churches of England are of great antiquity, and while some are magnificent specimens of ancient architecture others are very small and owe their charm to their unadorned simplicity. This photograph shows the tiny Norman church at Campton Greenfield near Bristol, built of local stone. Conditions are so primitive in the village that the church has neither electric light nor gas, and in the winter months candles in chandeliers provide light for the small congregation.

tradition, a deep inbred loyalty and wholesome respect for law and order.

Go into the little village church, ivied and lichened, grey with years. History stares at you from the escutcheon nailed above the door, the stone seats beside the entrance have provided rest for generations of tired folk. The bells whose ropes dangle from the misty rafters of the

**Extent**—North to south, 354 miles, east to west 210 miles, coast-line more than 2 000 miles. Area, 50,874 square miles. Population, 37 794,000.

**Natural Features**—Low rolling country broken by the Pennine Range in the north (highest point is in the Cumbrian Mountains, Scafell 3,210 feet), and the Downs and Devon hills in the south and south-west. Principal rivers Tyne, Humber (tributaries—Trent and Ouse), Welland, Nene and Great Ouse, Thames, Avon, Severn and Wye, Mersey. Climate, mild with little variation.

**Products**—Wheat, barley, oats, hay and forage crops, fruit, potatoes, cattle, sheep, pigs, poultry, horses, dairy products, herring, haddock, cod and other fish, coal, iron and clay, textiles, ships, iron and steel manufactures (including cutlery and machinery), chemicals, clothing, pottery and hardware.

**Cities**—London (population of 'Greater London' 8,655,000), Birmingham (1 048 000), Liverpool, Manchester, Sheffield (over 500 000), Leeds, Bristol (over 400 000).

opinion have blown since the days of the Reformation, and where now are the square pews were once ranged the medieval worshippers. As for the churchyard, the bones of the village fathers lie deep, pressed heavily, layer upon layer, in one rich mould of human soil. They sleep in their hundreds beneath the boughs of the trees which sheltered them when

## ENGLAND

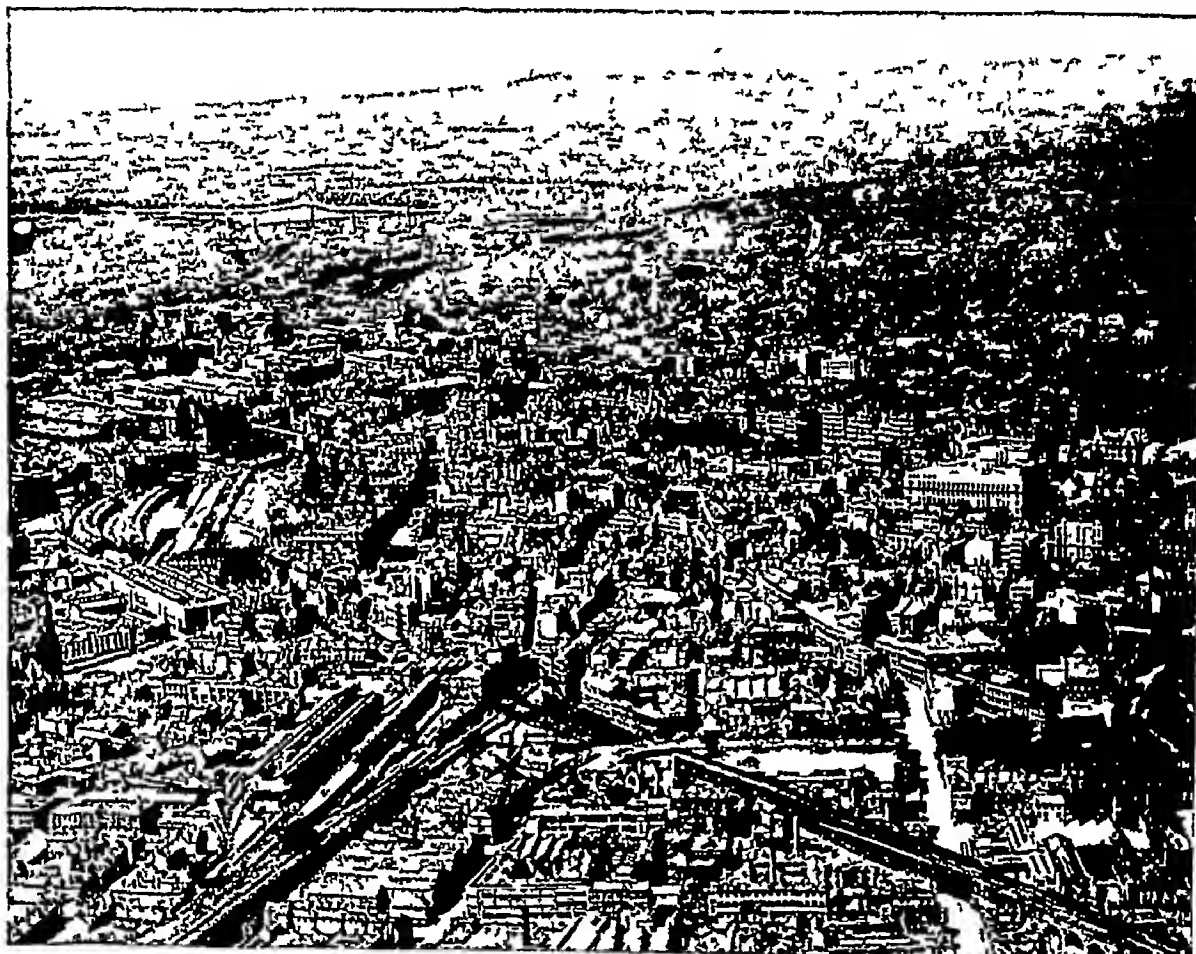
they came for archery practice after church service, within hail of the green over which they danced as blithe youngsters when time-honoured revelry greeted the return of May

But the story of England's past belongs to the next chapter. Here we are concerned with the land as it is, and so we proceed to take what may be called a bird's eye view

Geographically, England is the chief of the divisions of the British Isles, and forms an irregular triangle whose greatest side is only

hours and there is a great wealth of minerals—tin in the south-west, immense coal-fields in the centre and north, and some iron. Nowhere is the sea more than 100 miles distant—protecting the island from enemy attacks and inviting seamen to voyage forth for fish and in commerce

Despite the amazing growth of population—it increased by approximately 16,000,000 in the 60 years 1871–1931, until there are now about 750 people to each square mile—and the development of industry and transport, the



### BIRMINGHAM, GREAT CITY OF THE ENGLISH MIDLANDS

Birmingham is the second city in England and has a population of over 1,000,000. It is a great manufacturing centre, and as such pays one of the penalties of prosperity, for on most days in the year it is covered with a canopy of smoke. This remarkable photograph from the air was, however, taken on a day when a high wind had swept the smoke away, and it gives an idea of the extent of the city. On the left is Moor Street Station and above it New Street, the LMS station.

425 miles. Along the Welsh border are low mountains. But even the Cheviot Hills, which separate England from Scotland, and the Pennine Range, which runs southward into England and is called its "backbone," seldom rise above 2,500 feet. In the south-west, the Mendip Hills (highest 1,067 feet), the Cotswolds (1,100 feet) and Dartmoor (2,039 feet), though containing tracts of wild and desolate country, are the nearest approach to mountains.

In the main, England is a fertile and well watered land, with a good climate, neither very cold in winter nor very warm in summer. The numerous navigable rivers afford excellent har-

greater part of England is still unspoilt countryside, with some of the finest agricultural land and some of the most beautiful scenery in the world. To keep it such is our task and that of coming generations. (See *Countryside, Preservation of the*)

Much of the course of England's history may be traced to her insular position, though even the Atlantic is no barrier to an aeroplane, and only 21 miles separate England from France, her nearest Continental neighbour, at the Strait of Dover.

The east coast, which is, generally speaking, more regular in outline and drier in climate

## WHERE WHITE CLIFFS GUARD ENGLAND'S COAST



J. Dixon Scott

The white cliffs of Albion are the first scene to spring to a foreigner's eye when he thinks of England, for they seem—to Englishmen as well—to symbolize the sturdy individualism and rugged independence of the English character. One can easily understand why the returning exile's heart rejoices when he sights again the white walls of his homeland at Dover, where the great headland of the Shakespeare Cliff (seen above) juts out into the sea.



than the west, is washed by the North Sea, and in places is being slowly washed away by it. The principal inlets on this coast, from which the fishing fleet goes out to the Dogger Bank and the other North Sea fishing grounds, are the mouths of the Tyne and the Tees, the Humber estuary, into which flow the Trent and the Yorkshire Ouse, with its tributaries, the Wash, an extension of the low lying Fens, and the estuary of the Thames, London's sea gateway.

The south coast, from the South Foreland to the Lizard and Land's End, is broken by several harbours, notably Portsmouth Harbour, Southampton Water, and Plymouth Sound

important commercially as the Thames or the Trent, and its source actually lies in Wales. North of Wales we come to the Mersey, at the mouth of which is Liverpool, between Cumberland and the south of Scotland is the Solway Firth. The actual boundary between England and Scotland (about 100 miles long) is the valley of the Tweed and the Cheviot range.

To the west of the Pennines, in the north-west corner of England, are the Cumbrian mountains, standing sentinel over the beautiful Lake District. Windermere (10½ miles long) is the largest lake. In Yorkshire, the biggest county in England, is a great area of bleak moorland.



IN ENGLAND'S LAKE DISTRICT THE SHORES OF BUTTERMERE

The Lake District is by many regarded as the most beautiful stretch of country in the whole of England and is much renowned among foreign visitors. The sweeping dignified lines of its mountain scenery are in striking contrast with its flat green valleys, its lakes in such wonderful variety, its streams and waterfalls. This view of Buttermere shows High Crag towering majestically in the background. Notice the snow-capped summit. Buttermere is a favourite spot for hikers.

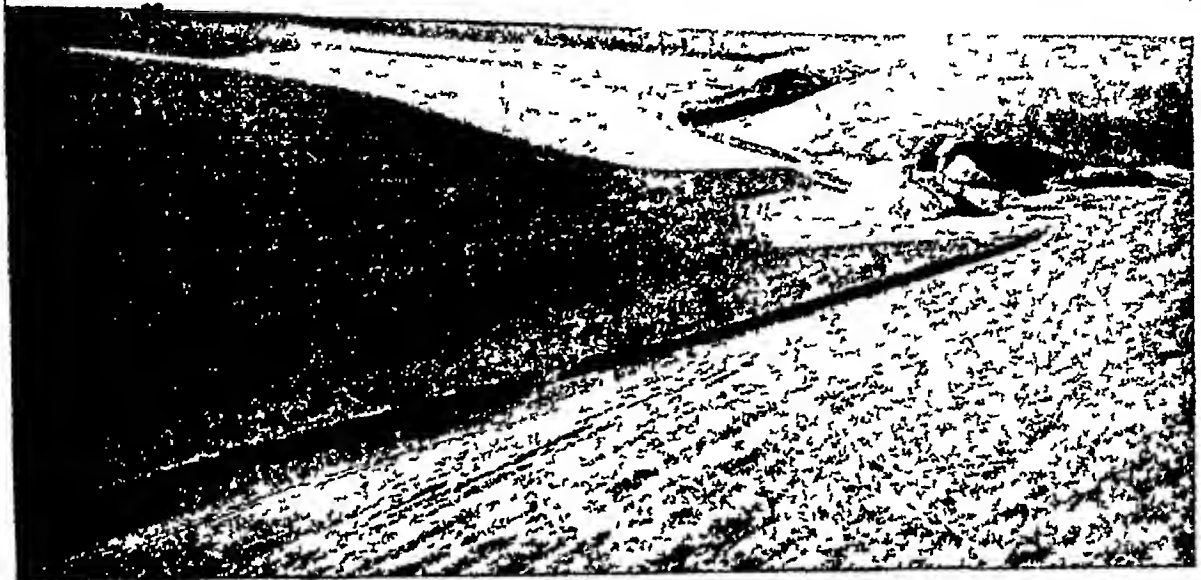
Half-way along, beyond the chalk cliffs of Kent and Sussex, is the Isle of Wight, geographically within the county of Hampshire. The head lands include Dungeness, Beachy Head, Selsey Bill, and Portland Bill. In the south-west the coast becomes high and rugged. Devon (which includes Lundy) and Cornwall, with the outlying Scilly Isles, form a rocky peninsula.

On the west the Bristol Channel forms the estuary of the Severn, which is Great Britain's longest river (220 miles). It is, however, not so

The hills of southern England are lower and have a more gradual slope. The Cotswolds and the Chilterns, both favourite districts, lie largely in Gloucestershire and Oxfordshire respectively. In Somerset, further south, are the Mendips and the Quantocks. Then, between London and the south coast, are the rolling North and South Downs (qv), and between them lies the Weald of Kent. Salisbury Plain, and the Wiltshire downs, may be regarded as a westward extension of these chalk downs.



## CONTRASTING ASPECTS OF ENGLAND'S FACE



These two photographs illustrate the widely-differing scenes that England offers. At the top is Salisbury Plain, Wiltshire. Its area is about 15 miles by 20 miles and it is composed of rolling chalky downs, practically treeless, and with but a few scattered homesteads. Contrast it with Oldham, seen beneath, one of Lancashire's great manufacturing towns. It is a centre of the cotton industry and the chimneys of many mills send up a canopy of smoke that obscures the sky above the homes of the thousands of workers clustered round about.

*Photos J. Dizon-Scott Fox*



#### A STORIED GLADE IN THE NEW FOREST

One of the glories of England is the New Forest the wonderful area of woodland lying between Southampton Water and the Hampshire Avon. It is about 144 sq miles in area and is densely wooded, the chief trees being the beech and the oak. It was here that William Rufus was killed by an arrow while hunting. The photograph shows the glade where William is believed to have met his death, and the Rufus Stone in the centre marks approximately the spot where he fell.

*Photo J. Dixon Scott*

The low-lying plains of England may be divided into three main areas—the eastern, including the Vale of York, the Fens, and East Anglia (Norfolk, Suffolk and Essex), the central, covering most of the Midland counties, and the western, from Lancashire to the Severn basin.

There were once huge forests in England, but the most important of the few remaining are the New Forest in Hampshire and the Forest of Dean in Gloucestershire. Dartmoor and Exmoor were once extensively forested. There are still many beautiful stretches of woodland and parks, but much of the latter is private ground belonging to the great landowners. Apart from the Lake District, England is almost devoid of lakes, although the Broadlands of East Anglia cover a fair-sized area when considered together.

Let us follow a visitor who has just landed at Liverpool, one of the greatest commercial cities. At its long grey docks he will see ships from Africa and Australia, from China, from India and from South America—indeed, from every great port in the civilized world. If it is summer, he will want to see something of the country before going to London, and will turn aside perhaps to visit quaint old Chester on the river Dee, near the border of Wales. Once a Roman camp, as its name tells us, its medieval walls follow on three sides the line of the old Roman walls, while its queer shops and old

timber-built houses make it one of the most picturesque of English cities.

In Manchester—like Liverpool, a city of Lancashire—we reach the metropolis of the great cotton industry. Through its huge ship canal, which connects the city with the Mersey and Liverpool, making Manchester practically a seaport, come steamers laden with bales of raw cotton from the United States, India and Egypt, to be sent on to Oldham, Bolton, Preston, and other neighbouring towns to be spun and woven into cotton goods. Why should the Lancashire region be given over so largely to cotton manufacture? The answer is to be found partly in its moist climate—the wettest in all England—which is particularly favourable to cotton spinning, and partly in the great coal-fields of the near-by Pennine Chain.

#### England as the Airman Sees It

If you were to fly over England in an aeroplane you would see a vast smoky district stretching from Cardiff in Wales to the river Tyne on the north east coast, and on the west coast to Glasgow and the Clyde district of south-west Scotland. Blacker, smokier, more crowded than anywhere else in this "Black Country" would appear the district about Manchester, for here are the richest coal-beds, and, therefore, the greatest factories. Along the Trent in Staffordshire are great pottery works, and

here lie the "Five Towns" that Arnold Bennett made famous in his novels

Not far away, where iron and coal are found close together, is Birmingham, in the counties of Warwickshire and Worcestershire—the greatest metal manufacturing centre in England and, perhaps, in the world. Sheffield, 75 miles to the north, in the south of Yorkshire, has similar advantages, making it the world's centre for cutlery. In this same busy region are others of England's great industrial cities—Coventry, which makes all kinds of machines, Nottingham, known for its laces, Huddersfield, Halifax and Bradford, with their world-renowned woollen mills, Leeds, the leading cloth market of Europe, and also a city where heavy machinery of all kinds is turned out. If shipping and trade constitute one leg by which England strides to greatness, manufacturing is certainly the other.

But, tiring of this bustle and smoke of factories, perhaps we can rest a little in the beautiful Lake District, already mentioned in our topographical survey. Here is the country made famous by Wordsworth and the other "Lake Poets."

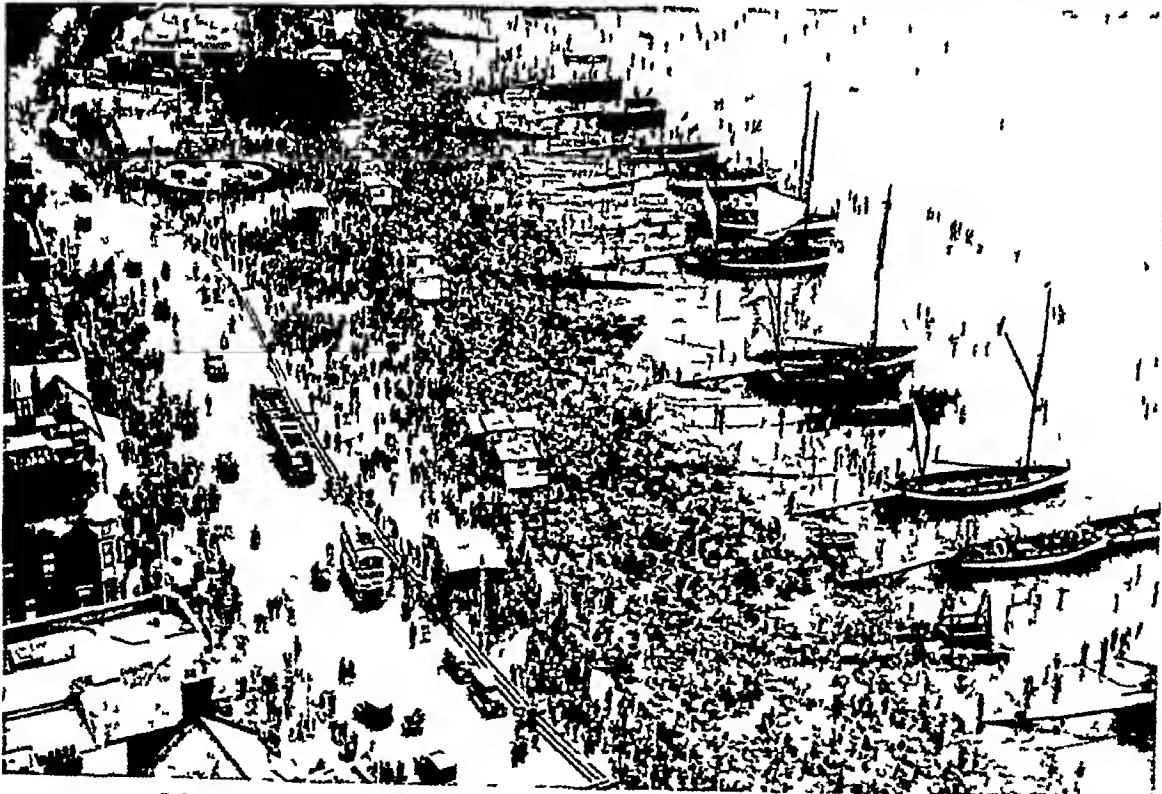
As we approach the Scottish border we find a reminder of Britain's early history in the remains of the old Roman wall, built by the Emperor Hadrian, stretching from a point west of Carlisle to what is now the busy city of

Newcastle on-Tyne—a distance of 73½ miles. Many miles of this great wall still stand, shorn it is true of more than half its original 20 feet of height, but still a carriage road in width and striding majestically over hill and down dale as in the proud old Roman days. Newcastle is only one of the great towns whose shipyards have meant so much to England's commerce.

#### Cities of the North-East

Less than 20 miles south of Newcastle on the eastern side of the island is the wonderful old city of Durham. Here stands the hoary cathedral, "half church of God, half castle 'gainst the Scot," which today is the finest existing example of a Norman Romanesque church. As we travel southward now, we come upon many more of these picturesque old cathedral cities, each with its own individual character. York, the seat of an archbishop, has the largest and, perhaps, the grandest of all English Gothic cathedrals. Hull, on the Humber, owes its importance to its fisheries and extensive commerce, as does Middlesbrough to the neighbouring iron-field, and Lincoln, some 50 miles beyond Hull, presents a cathedral which historically is more interesting than York's.

Lichfield cathedral, in the very heart of England, where once spread the Saxon kingdom of Mercia, is one of the smallest, but also one of



**LONDONERS ENJOYING THEIR BANK HOLIDAY BY THE SEA**

For

All through the summer months, but especially in August, every English seaside resort is thronged with holiday makers who find their way thither by railway motor-coaches, and motor-cars. This photograph shows the crowded beach at Southend-on-Sea, on the Thames Estuary, the nearest seaside resort to London. At Southend the tide goes out more than a mile, and while there is still water enough to float the pleasure boats beached on the shore, it is possible to wade out a long way. Southend has a pier over a mile and a quarter long, the longest in England.



#### IN THE SHEEP COUNTRY OF THE COTSWOLDS

As we travel westwards across the central plain of England, the first range of hills to be reached is the Cotswolds. These rolling, down like hills provide scenes of tranquil beauty typical of the English countryside. The hills provide excellent grazing for large flocks of sheep, different farmers have grazing rights over the hills and join forces in the work of collecting and washing the sheep. This photograph shows a round up of sheep on the Cotswolds, near Winchcombe in Gloucestershire.

the loveliest of these old churches, and Ely, with its massive Norman towers, rising in the great fen district of Cambridgeshire—now drained and cultivated—is one of the most majestic and impressive of these shrines. Not far from Ely is the university town of Cambridge with its historic old halls. It ranks in fame and educational importance with the university at Oxford, on the upper Thames, 76 miles to the south west. Fifty-eight miles from Cambridge, we come at last to roaring, bewildering London—the mightiest metropolis in all the world, the capital of the whole British Empire, and a place where weeks and months may be spent in historical and literary pilgrimages.

#### Industry on the Move

The Black Country which we saw in the north is a new England created 150 years ago by the Industrial Revolution, and it is the home of manufacturing. In the pleasant Thames valley and the region south of it we find ourselves in yet another England—one of green meadows and hedgerow-bordered fields, where villages of quaint thatched cottages are lorded over by stately old manor houses. Perhaps the most significant development in English industry since the World War has been the movement of manufacturing activities to the south east, particularly in the London area, where there are advantages of distribution and centralization.

Let us now sail down the broad estuary of the Thames, with its myriad ships coming and going on the world's commerce, and turn southward about Kent to skirt the beautiful and historic shores of the southern coast. In Kent the conquering Anglo Saxons landed nearly 15 centuries ago, and there St. Augustine set up his see of Canterbury, England's mother church.

In Sussex, once the kingdom of the South Saxons, William and his Normans first set foot on their great invasion six centuries later. Then, in Hampshire, as we have seen, is the harbour of Southampton Water and, off Spithead, the great naval station of Portsmouth. What scenes of Britain's naval glory have these waters witnessed, from the time of Drake to the present day! Inland lie Winchester, the capital of England in Saxon days, and the cathedral city of Salisbury.

In picturesque Devonshire we come to Plymouth, another famous seaport. Up the west coast, where the Avon flows into the broad Bristol Channel, is Bristol, once the chief port of western England. Everywhere, indeed, in this "tight little island" we come upon traces of a historic past, vistas of scenic loveliness, evidences of commercial greatness. (See also British Isles, English History, Government, United Kingdom, and the articles on the countries and the chief cities.)

# PLEASANT WAYS IN ENGLAND



The Lake District of Cumberland and Westmorland provides some of the finest scenery in England. Here we see Grasmere, one of the most famous of the lakes. Across the lake can be seen Helm Crag a rocky hill rising to a height of 1 279 feet above the surface of the waters. In the village of Grasmere, beside the lake the poet Wordsworth lived for fourteen years. Great efforts have been made to preserve the Lake District from defacement by new buildings, and large areas have been purchased for the public.



# WHITE CLIFFS FRINGING THE BLUE WATERS OF THE ENGLISH CHANNEL

The great chalk mass of the South Downs runs from just north of Portsmouth until it terminates at the straits between Seaford and Eastbourne. Berchmy Head being the eastern extremity. West of Berchmy Head there are chalk cliffs much lower but of great beauty. They form the succession of headlands seen above known as the Seven Sisters. The headland in the foreground is Seaford Head, and it is impressive as Berchmy Head itself.









H. W. Nichols

### ***OLD SALTS REPAIR THEIR NETS***

At many seaside places where the fishing boats are drawn up on to the beach such a scene as this may be met with. Above high watermark is a row of sheds in which the nets are kept, and these three old fishermen sitting in front of one of them, are at work repairing the nets damaged on the last fishing trip. The sea takes a heavy toll of their gear.



S. H. VIELLO

### *THE VILLAGE SMITH AT HIS ANVIL*

Motor-cars and motor-tractors have not yet driven horses from the English countryside and teams still draw the wagons or plod patiently in front of the plough. The village blacksmiths therefore, still spend much of their time making horseshoes though many of them have found it necessary to add a knowledge of the petrol engine to their skill at the anvil.



A STREET OF COTTAGE HOMES IN A WEST OF ENGLAND VILLAGE

Though the old cottages of England were the work of local craftsmen using the material that was to be found in the neighbourhood without any architect to supervise their work, they have a charm and character of their own which wins for them the admiration of every traveller. This humbler form of domestic architecture is well seen in this photograph of the village of Thurlestone in Devonshire. The cottages are built of cob, a mixture of sand, gravel and straw which, with a thickly thatched roof makes them cool in summer and warm in winter.



BY THE BANKS OF BEAUTIFUL DERWENTWATER

Derwentwater is the most famous, and by common consent the most beautiful, of all the English lakes. It is 3 miles long and 1 mile wide. On its banks there are wooded slopes, rocky uplands and steep crags and the charm of the lake is added to by the numerous islets. A curious feature of the lake is the Floating Island, a mass of weeds, which from time to time is raised to the surface by the action of marsh gas. The mountain background is very impressive, and to the north rises Skiddaw, 3,051 feet high



F. Deaville Walker

### *IN A CORNISH FISHING HARBOUR*

One of the most picturesque villages of Cornwall is Polperro. It lies on the south coast near Looe, at the foot of cliffs 400 feet high and is approached by a narrow gorge. On the side of the cliff are clustered stone-built cottages rising one above the other, and beneath them lies the little harbour, dry at low water in which the boats employed in the pilchard fishing industry find haven.

# ENGLAND'S MASTERS of the BRUSH

*Though England has produced no "old masters" in the generally accepted sense, there are English painters of world renown and there is a recognizably British school, notable for portraiture and landscape*

**English Art.** Long before painting came into existence two other branches of pictorial art were highly developed in Europe illumination and mural decoration



Princess Lieven  
a portrait by  
Sir Thomas Lawrence  
National Gallery

illumination flourished especially in Britain As far back as the 8th century English artists were producing fine illuminated manuscripts, especially at Canterbury Most of these men were monks, and most of their work consisted in the illumination of the borders and headings of religious works, or Bibles There are many styles in this type of work,

the earliest of them influenced by Byzantine art, but the most important British illuminations of the 8th century were those of the Irish School, whose finest productions, the Book of Kells, the Lindisfarne Gospels, and the Book of Durrow rank among the world's masterpieces of illumination

In England the Anglo Saxon school attained its greatest perfection in the works of the Winchester School, whose masterpiece is the late 10th century Benedictional of St Æthelwold The 12th century produced the Anglo-Norman School, at Winchester, Bury St Edmunds, and elsewhere in the south and east were produced fine manuscripts, many of which show those weird beasts and fantastic creatures which one is apt especially to associate with the word illumination This school was succeeded in the next century by a completely new one, which reached Britain from France and which was in tune with the general development of Gothic art in that country To the late 14th century belongs the famous Bedford Book of Hours, in which initials are filled with little portrait medallions of several hundred celebrities of the time

While English art, as seen in illuminated manuscripts and the miniatures that accompanied and illustrated them, could compete on equal terms with anything then produced on the Continent, there was another branch in which the English were soon to become the greatest masters—that of miniature painting as we now know it

The English miniaturists, however, were profoundly influenced by the work of Hans

Holbein (qv), who not only spent many of his most fruitful years in this country, but produced some of the world's finest miniatures Holbein died in 1543, and four years later our first great artist in this line was born, namely, Nicholas Hilliard (1547-1619) His work shows the influence of Holbein, in early examples especially, but the influence of English illuminators is seen in the delicacy of decoration and ornament which is far removed from the sombre, almost stark simplicity of Holbein Hilliard enjoyed royal patronage under Queen Elizabeth and James I, and he ranks as the first of our native painters whom we can call a master

## Early Artists of the Miniature

Hilliard was succeeded by many other men who became famous for their miniature portraits They include the Olvers, father and son, and the Hoskins, father and son, of whom the elder, John Hoskins (d 1664), taught Samuel Cooper (c 1609-1672), greatest miniaturist of all His miniatures are real portraits, indeed, contemporary critics averred that, if enlarged to life size, they would appear to have been painted that size—high praise for paintings which occupied, at the most, only six or seven square inches Many of Cooper's works, together with those of other notable miniature painters, are in the national collection at the Victoria and Albert Museum

In Cooper's day there were many other fine exponents of this art, including his own brother Alexander, but it was not until after the middle of the next century that another great miniaturist appeared, in the person of Richard Cosway (1742-1821) He had many imitators conscious and unconscious, and as miniatures are very often unsigned, it is extremely hard to tell which are his work, at one time any really excellent miniature of his period was attributed to Cosway His contemporaries include George Englehart (1750-1829), the Hones, and the Plimers

So far we have been dealing only with illumination and miniature painting, arts which exist to a certain degree at the present day, although illumination is now represented more by the black and white decorative work of engravers such as Eric Gill and Robert Gibbings, or the "decorations" of Rex Whistler Very little is known about any other type of painting in Britain prior to Stuart times, and still less about the painters There are, however, a certain number of more or less well-preserved paintings on the walls of churches—and a few on screens and other objects—scattered all over





### MASTERPIECE OF ILLUMINATION

The greatest of purely English schools of illumination was that of Winchester, and here you see a page from its most famous production the Benedictional of St. Æthelwold.

The figure is that of St. Etheldreda

*Courtesy of the Duke of Devonshire*

the country. Among the earliest of these are 12th-century paintings at Canterbury. To the next century belong those at Winchester, and the 13th century roundel in the Chapel of the Bishop's Palace at Chichester. This last painting shows the Virgin and Child, and although we have no notion who the artist might have been, there is no doubt that it is our finest medieval painting.

In the 13th century, too, lived Matthew Paris, the author and illustrator of important historical works. The many pictures in his books, notably heads and full-page, full-length drawings of the Virgin and Child, show that he was original and had great artistic ability.

To find good paintings of definite date we must now pass directly to the end of the 15th century, when the walls of Eton College Chapel were decorated with a series of paintings of the Miracles of the Virgin. They seem to have been executed, in part at least, by one William Baker. Art experts can trace in these paintings something of the style of the Winchester school of illuminators, and the same influence may be discerned in the portrait of Lady Margaret Beaufort in the National Portrait Gallery, done about 1485.

But such examples as these are very few and far between. Holbein was monopolizing court painting during the early 16th century,

and he was succeeded, later in the same century, by Flemings such as Sir Anthony Mor and Hans Eworts (anglicized as Eworth). John Bettes is a name that stands out, since we have a single very Holbeinesque portrait by this artist in the National Portrait Gallery. Other portraits were almost all done by men from the Netherlands, not only in Stuart times, but well into the eighteenth century. Not unnaturally, as they settled in Britain, or at least spent much time here, these men were influenced by their surroundings, but even so the names of Daniel Mytens (c. 1590-1642), Cornelius Janssen (1593-1664), Marcus Gheeraerts (c. 1561-c. 1635), alone bespeak their foreign origin. Van Dyck, too, reaching England in 1632, and working here a great deal, had tremendous influence.

Two more painters of such type are Lely (whose real name was Peter van der Faes) (1618-1680) and Kneller (1646-1723). Both were fine painters of portraits in the grand manner, the former especially showing the influence of Van Dyck, and both were good technicians. A figure deserving mention is that of William Dobson (1610-1646), whose early death cut short a career of great promise. Another of whose work we have material evidence is Robert Walker (c. 1600-c. 1660), who painted portraits of Oliver Cromwell.

Slightly later come William Riley (1646-1691) and J. M. Wright (1625-1670), a Scot. Both these painters, who are represented in the National Portrait Gallery, show some originality. After their time came a gap in which we find only the rather solitary figure of Sir James Thornhill (1675-1734), the mural decorator of the dome of St. Paul's, who also worked at Greenwich, in Hampton Court, and in many other large buildings in and near London. His drawings are considered finer than his finished work. But Thornhill is chiefly remembered in connexion with our first great native artist, William Hogarth (1697-1764), for Hogarth not only studied under Thornhill, but also eloped with his daughter!

Hogarth was influenced more or less equally by the Dutch and the Italians, both in his subject matter, which was completely new in a country such as England, and in his technique and use of colour. From the lay man's point of view, the greatest gift Hogarth brought to painting in England, was that of life and light, for the difference between his lively, colourful, and brilliantly drawn scenes from real life and the estimable, but dull, portraiture which had long stood for painting in Britain is tremendous, his own portraits, too, are a huge advance on previous work. Hogarth did not have a very wide influence, even on those painters who studied under him. Joseph Highmore (1692-1780) is spoken of as one painter



## ENGLISH ART

who shows this influence, you can see some of his works in the National Gallery.

From the time of Hogarth the names of English painters become more and more numerous. Thomas Hudson (1701-1779), for example, was a good portrait painter, but he can only be considered here as the master of Reynolds and Gainsborough, in this capacity, he had a wider influence on the development of the English school than he did through his own works. Another man whose work influenced Reynolds was Allan Ramsay (1713-1784), himself also a portraitist of great merit. Especially famous as a painter of women, he was court painter from 1767 until his death. His finest work is in the galleries of Edinburgh.

Now we come at last to Sir Joshua Reynolds (1723-1792), our greatest portrait painter. For all his faults—and they are not a few—Reynolds stands foremost among members of the British school, not only for the tremendous influence which he had on his art in this country, or merely through his excellence as a painter, but also as a great man.

One noteworthy point about Reynolds was his perpetual willingness to learn, indeed, it is true to say that his art went on improving as he grew older. He was, essentially, a painter of men, and of intellectual men at that. On the whole, the finest of his portraits are perhaps the series of literary celebrities of his time, men who were his friends as well as his sitters, his portraits of Dr Johnson, Boswell, Sterne, etc., are amongst the finest examples ever done of this type of art. His women were dignified, beautiful, but often lacking in humanity. As a painter of children he excelled.

Reynolds, ever a keen student, gained hints from all the great painters whose work he knew and examined, and thus, indirectly, he widened the knowledge of all who followed him. He himself was at first influenced by Allan Ramsay, but later Allan Ramsay was learning from him. In his "Discourses on Painting," too, Reynolds imparted much sound advice which is still of value to students of art. Finally, as part founder of the Royal Academy, and its first president, he had an enduring influence on the "business" side of British art.

It was unfortunate that Reynolds experimented with all manner of pigments and mediums, and so ruined many of his greatest works

for posterity. In this as in many other respects, he differed from his great rival, Thomas Gainsborough (1727-1788). As to which was the greater painter, argument will be endless, but while there is no doubt that Reynolds had a more marked influence on the development of the British school, it is equally certain that Gainsborough was the more sincere artist. This is perhaps not unnatural, when we consider that he had none of the advantages of travel and social contact which were part of Reynolds's life. Gainsborough was largely self-taught as his fine landscapes, founded on his own intimate knowledge of Nature, show, and although he spent a certain amount of time copying the old masters, he certainly did not use them as did Reynolds. He had, besides, much more of the traditional artistic temperament, a fact which is shown in his love of music and in his choice of friends.

Technically, Gainsborough was not always superior to Reynolds, but he used purer colour and his brushwork was often finer. Moreover, most of his pictures maintain the same high standard throughout, for he did not use assistants.



NELL GWYNN AS PAINTED BY LELY

Sir Peter Lely, who painted this lovely portrait of Nell Gwynn, was perhaps the best of the men who followed Van Dyck in England. Flemish in manner, his painting none the less absorbed some of the atmosphere of the country of his adoption. This picture is in the National Portrait Gallery.

to put in the draperies, backgrounds, and other less interesting parts of his portraits. In fact, the landscape background in many of the finest Gainsboroughs reflects the mood shown in the sitter's face.

Before turning to the landscape school, which Gainsborough also largely inaugurated, we must note some followers of the two masters of the English portrait school. Foremost among them were Romney, famous for his pictures of Lady Hamilton—he did over sixty—and Raeburn, renowned for his magnificent portraits of Scottish notabilities. George Romney (1734–1802), having early incurred the hostility of Reynolds, never exhibited at the Academy, yet he was sufficiently successful to be a thorn in the President's side. His great quality is a certain soft, warm charm which he imparts to his portraits, especially those of women and children. Something of Romney's warmth is also to be seen in the female portraits of Sir Henry Raeburn (1756–1823), a Scot who lived and worked almost entirely in his own country. It is as a painter of men, however, that Raeburn, with his vigorous style, strong colour, and straightforward manner, is chiefly famous.

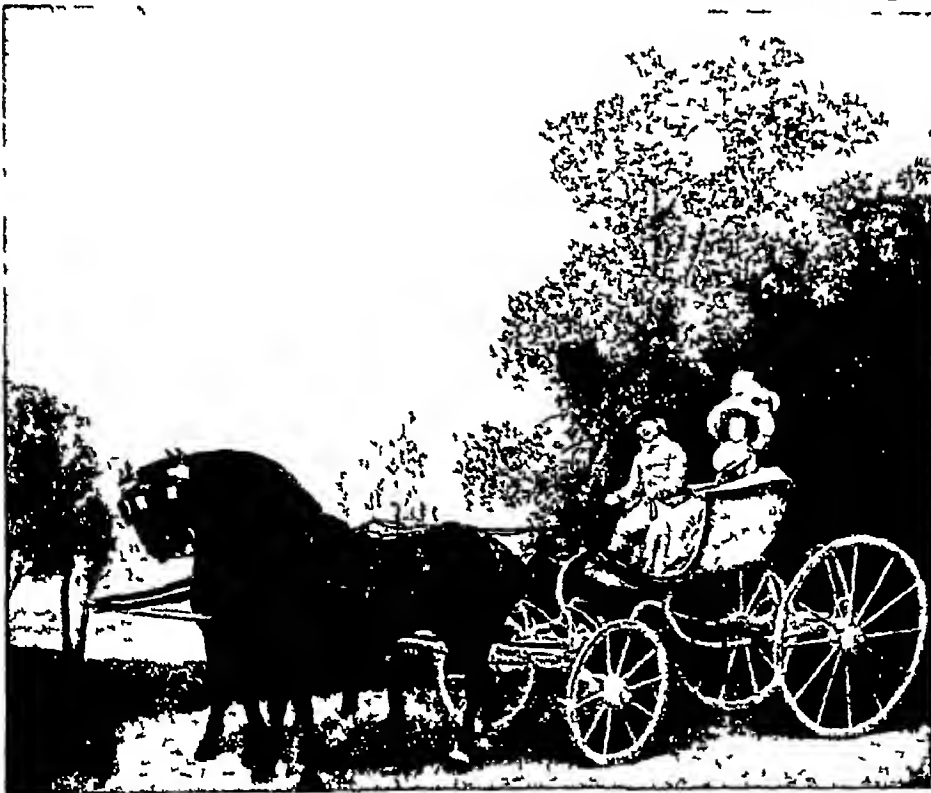
The last great painter of the English portrait school was Sir Thomas Lawrence (1769–1830). Something of an infant prodigy, at the early age of 25 he was a full Academician. He was a

notable painter of women and children, and, above all, a deft and ingenious draughtsman, but he tended to make all his sitters almost inhumanly sweet. As the most influential portrait painter of his time, however, he had many followers, while among his rivals was John Hoppner (c. 1758–1810). The latter, admittedly a disciple of Reynolds, painted many charming portraits, which have also retained a value far beyond their artistic worth. Other followers of Reynolds were Francis Cotes (1725–1770), James Northcote (1746–1831), John Opie (1761–1807), and Rev. Matthew William Peters (1742–1814), all good portraitists. The fame of Angelica Kauffman (1741–1807) rests more on her work as a mural decorator than on her paintings, she did, however, a number of pleasing, if rather weak, portraits, notable for their delicate colour, and well known through their reproductions by the engraver Bartolozzi.

The last-named was a member of the great British school of mezzotinters. Already for many years this art had been practised by the Dutch engravers, Lely especially inspiring some fine works. But in the 18th century men such as Valentine Green (1739–1813), John Raphael Smith, Bartolozzi himself, and others, produced many superb reproductions of the work of artists already described, as well as of our great landscape painters. Mezzotinting has

survived to modern times, although only in isolated instances, Sir Frank Short is perhaps the finest modern worker in this medium. (See Engraving)

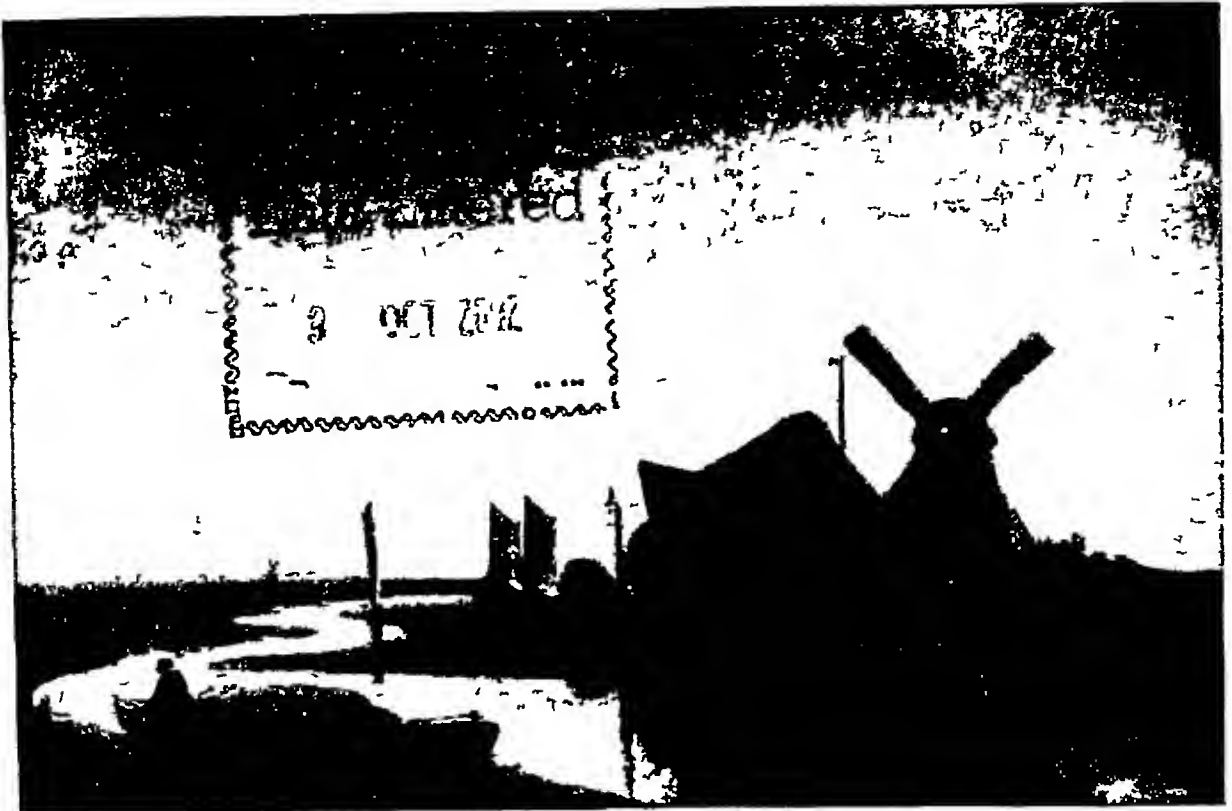
The English landscape school owes a great deal to Gainsborough, who was perhaps the first of all landscape painters to paint Nature as he saw it, without adding classical buildings and other accessories, and who always thought of himself as a landscape artist. Curiously enough, the other great early English landscape painter was also a portraitist of some skill. This was Richard Wilson (1714–1782), one of the most original of British artists. His land



SPORT AND PORTRAITURE COMBINED

During the 18th century a notable school of English sporting painters arose, of whom the finest was George Stubbs. In this 'Phaeton and Pair,' which combines his favourite type of equestrian subject with a charming portrait, he shows himself an excellent draughtsman and a fine artist. Such a painting is also useful to students of the costume of the period.

National Gallery



**'OLD CROME' WHO PAINTED THIS WAS SELF-TAUGHT**

There is no mistaking the English origin of such a picture as this 'Moonlight on the Marshes of the Yare,' nor is it difficult, even for a beginner, to attribute it correctly. For the work of John ('Old') Crome, the self-taught genius who founded the 'Norwich School' of landscape painting, is unmistakable. Though largely influenced by the Dutch painters, Crome attains a livelier, more natural representation of the scenes of his native East Anglia in this satisfying masterpiece.

National Gallery

scapes show the influence of a visit to Italy, but before this he had done some brilliant portraits. At his best, as in his glorious views of Snowdon, Cader Idris, and other Welsh hills, Wilson is a great artist. He achieved a great deal towards a true rendering of the "atmospheric" quality of a scene, and at the same time kept close to Nature, a feature not present in the work of any previous artist in his own line. The influence of Claude Lorrain and Poussin is visible in his work, but he excelled them in many respects, and his own influence on Crome and Turner was also considerable.

Contemporary with Wilson were other landscape painters, such as Samuel Scott (1710-1772), who depicted chiefly marine subjects and also recorded the London of his day, and from now onwards such artists enjoyed more prominence. Most of them were water-colourists, such as Paul Sandby (1725-1809), who is sometimes considered to be the "father of British water-colour", Alexander Cozens (c. 1698-1786), and his son, John Robert Cozens (1752-1797), who did some superb Alpine landscapes, and, finally, Thomas Girtin (1775-1802), a great painter who, in spite of his short life, had a tremendous influence on his art. From Girtin, too, we can follow the whole sequence of the development of water-colour painting, which

has been essentially an English art, through Cotman (see Cotman, John Sell), David Cox, de Wint, Rowlandson (q.v.) and others, to the present day. (See Water-colour Painting)

More important, however, since we are concerned mainly with oil painters, is John Crome (1768-1821). A self-taught artist, he was born in Norwich, the son of a journeyman, and spent his early life chiefly as an inn sign painter, and later copying engravings. His interest in painting led him to study the works in those collections to which he could obtain access, and as these contained largely Dutch paintings, it was not unnatural that his work should be influenced in that direction. Not until he was about forty did he produce his first really great painting. He earned money by teaching drawing, founded the Norwich Society for exhibiting paintings, and went but little outside his native town.

Crome holds a high place in the history of landscape painting. Like other English landscape artists, he observed and drew Nature at first hand, and no one has reproduced with such truth the heaths and flat lands of East Anglia. Yet by the middle of the 19th century Crome's pictures were forgotten, and it is said that the famous view of Mousehold Heath, now in the National Gallery, was purchased at one time for a | BVCL

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his own peaceful life, which in every way was a contrast to that of our next subject, Turner

J M W Turner (1775-1851), considered by many to be the greatest of all English painters, and certainly one of the world's greatest landscape artists, was probably born in London. He led a strange, solitary life (See the article on Turner, J M W)

As a popular painter, Turner is perhaps rather difficult to understand, especially in his more brilliant works, with their nebulous, fiery colour, and intensity of light. Yet if we start with his earlier works and then consider the glorious masterpieces of his later days, we can easily recognize the various stages of his work.

Turner travelled a good deal, and wherever he went he added something to his style. His earlier works, with their more sombre hues and less vivid atmospheric effects, are simple enough, and no one can fail to be impressed by the power and the observation with which he could paint the sea—better, perhaps, than anyone who has ever lived. To see his colour at its most striking, and to see the best of the phases in which he so clearly anticipates the Frenchmen of the end of his century, we must examine the later water-colours of this master.

Very different from Turner is John Constable (1776-1837), who continues to have a far greater popularity, since he is the more easily understood. Constable painted the scenes we can see any day in the country, and that is why

he has such a wide appeal, and why his work is perhaps the most popular of all landscape in reproductions. Constable was the first British artist to achieve real fame on the Continent. Yet Constable—like Crome, and unlike Turner—did not achieve early brilliance. Even at the age of forty he was only beginning to feel sure of himself. Perhaps this was because he deliberately set out to be a "natural painter," to reproduce the scene as it was, at all costs. And in so doing, he did a great service to art. We are fortunate in having a very complete and valuable series of

Constable's paintings and sketches which show the artist's entire development, from his early efforts to his most complicated manner. These are in the Victoria and Albert Museum, a visit to which will make it clear why he is considered the forerunner of the French Impressionists.

Another rather isolated figure in the story of the English school is R P Bonington (1801-1828), who, had he lived, might have achieved real greatness. He showed considerable French influence, and was himself influential in France, where he spent much of his time.

We must go back a little to pick up the threads of yet another type of British art, that of the "conversation piece," for the most

part showing groups or families, indoors or out. Among the earliest painters of the conversation piece was Arthur Devis (1711-1787), whose naïve little people have a certain distinction which makes his pictures always popular. Then there was John Zoffany (1733-1810), who did also many good groups and portraits, and was influenced by Hogarth. And in yet another aspect of the British school we have the painters of sporting scenes, of men and horses, of whom George Stubbs (1725-1806) is the most notable representative. His groups have much of the "conversation piece" atmosphere. This leads us to pure "genre" pictures (i.e. the portrayal of ordinary life), such as those of George Morland (1763-1804), who painted in the country inns and blacksmiths'



A SCULPTOR'S PAINTING

Far better known as a sculptor than as a painter, Alfred Stevens stands almost by himself in the 19th century. His rare portraits show an easy mastery and a style which is still obviously "modern", you could never call this portrait of Mrs. Collmann an "old master". The influence of Michelangelo is noticeable in his work.

National Gallery

shops, and whose work is very widely known through engravings. Similarly Francis Wheatley (1747-1801) is remembered by his famous "Cries of London" series.

A remarkable artist whose work cannot be overlooked was William Blake (1757-1827). You will find his work described in a separate article (See Blake, William). Men whom he influenced were Edward Calvert (1799-1883) and Samuel Palmer (1805-1881). A friend of his, too, was the great illustrator and draughtsman, John Flaxman (1755-1826). Another fine

draughtsman, but of a very different type, was Alfred Stevens (1817-1875), who ranks as the first of the "modern" painters—as opposed to "old masters." He painted some very fine portraits, but his name is almost unknown except as a sculptor (See Sculpture). He was influenced especially by Michelangelo, and it has been said of him that he alone of artists in his day and country caught the spirit of the Italian Renaissance. He is followed by G. F. Watts (1817-1904), who has many fine portraits to his credit.

Perhaps because his best-known works, such as "Hope," are allegorical, Watts is often associated with the Pre-Raphaelites, though neither he nor several lesser painters of a rather similar style, such as Lord Leighton (1830-1896), Sir Lawrence Alma-Tadema (1836-1912), and Sir Edward Poynter (1836-1910), had anything to do with them.

The original members of the Pre-Raphaelite brotherhood were Sir J. E. Millais (1829-1896), Holman Hunt (1827-1910), and D. G. Rossetti (1828-1882). Constituting a deliberate revolt against the decadent conditions of art at the time (1849), they had a considerable influence, not merely directly on painting, but also indirectly, on applied arts, especially through William Morris (1834-1906), who was more designer than painter, and to whom a revival in good book production is largely due. (See Morris, William). Other names of note at this time were those of Sir Edward Burne Jones (1833-1898), Ford Madox Brown (1821-1893), and Daniel Maclise (1806-1870).

William Etty (1787-1849) is a painter who falls into no particular group. He is our finest painter of the nude, and it is worth noting that throughout his career he studied at the life class at the Royal Academy schools. He was strongly influenced by the Venetians. Contemporary with him are *genre* painters such as Sir David Wilkie (1785-1841), William Mulready (1786-1863), and William Powell Frith (1819-1900), famous for his "Derby Day."

Sir Edwin Landseer (qv), was the most popular artist of his time.

While the Pre-Raphaelites were flourishing, J. M. Whistler (1834-1903) was beginning to horrify the public by his Impressionist paintings, which also showed considerably the influence of Japanese art, then quite unknown in England. It was the titles of Whistler's works, as much as their content, that upset the stolid British public and critics alike, for he gave them what appeared to be musical names—"Arrangements," "Nocturnes," etc. Later, as an etcher, he did even greater work.

In spite of Whistler, the Academicians continued to produce their "problem pictures"—

those of Orchardson (1835-1910) being typical examples—dull portraits, seascapes and landscapes. But at the newly-formed New English Art Club and the "International Society" modern works were being exhibited, and by 1910 the masters of the modern English School were all fairly well established. Another American, John Sargent (1856-1925) was famous for his brilliant, though sometimes superficial portraits, and, like him, William Strang (1859-1921), a portrait and subject picture painter, showed the Impressionist influence. Mention must be made of Charles Conder (1868-1909), perhaps the world's finest painter of silk fans, Charles Wellington Furse (1869-1904), a painter in the



GRIM MODERNISM

Whether you like it or not, you cannot fail to feel the tremendous power and intensity of this painting, "La Mitrailleuse" (the machine-gun). The artist, C. R. W. Nevinson, was especially influenced by Cubism and Italian Futurism, while this is also obviously a product of war.

National Gallery

grand manner of outdoor pictures, and Aubrey Beardsley (1872-1898), a true genius in black and white, largely influenced by the Japanese. Two important influences were the Glasgow and Newlyn Schools. The former gave us James Crawhall (1861-1913), whose small output includes some of the finest studies of birds and animals ever done, and Sir John Lavery (b. 1857), a very fine portrait painter, as well as many others. The Newlyn School included, among others, Henry Tuke (1858-1936), a great painter of seascapes and nudes.

The greatest master of the modern English School, P. Wilson Steer (b. 1860) was a real Impressionist at first, but in the great landscapes



for which he is best known he also showed the influence of Turner and Constable, with whom many would class him as a landscape painter. Similar in many ways to Wilson Steer was Henry Tonks (1862-1937), a fine portrait painter who also did delightful "conversation pieces." The Impressionist technique, too, was exploited by Sir George Clausen (b 1852).

Other living painters who were already prominent before the War are Sir William Rothenstein (b 1872) and Walter Sickert (b 1860). The former, influential as a teacher and notable as a writer besides, has done many very fine portrait-drawings, and a large number of oils. His brother, Albert Rutherston, (b 1881) is best known as a designer and illustrator. Sickert, an experimenter in many styles, has had a great influence on English painting, himself having developed from Impressionism. An artist whose work has been more appreciated abroad than at home, where he is best known as an etcher and mural decorator, is Frank Brangwyn (b 1867). He makes a complete break with the trends we have noted above, with his tremendously vigorous drawing, strong, very rich colour, and a generally romantic outlook. Sir C. J. Holmes (b 1868), who first showed the possibilities of the "industrial landscape," Arnesby Brown (b 1856), famous for his landscapes with cattle, and Sir D. Y. Cameron (b 1865) are other notable painters of the 20th century.

#### Modern British Portraitists

The modern British School has produced three great portraitists. The first, Ambrose McEvoy (1878-1927), had he lived, might well have rivalled his two contemporaries. His portraits show a great interest in light, and have a cleanness of colour and a general air of brightness which in themselves are signs of the new century. They differ widely from those of Sir William Orpen (1878-1931), one of the most successful portrait painters of his day. Besides his portraits, Orpen did many other excellent paintings, especially the fine series in the Imperial War Museum. Finally, as the third of this group, we have Augustus John (b 1879), one of our greatest painters. John excels in portraiture, having made his name in this type of work. But before the War, too, he did some superb etchings, which a few critics are prepared to hail as the greatest, in their way, since Rembrandt. This side of his work is not generally known, however, and it is for such magnificent paintings as his "Mme. Suggia" in the Tate Gallery that John is best known.

The members of the "Camden Town Group" included Harold Gilman (1876-1919), a very interesting painter who unfortunately, died comparatively young, Charles Ginner (b 1879), another original worker, and Percy Wyndham Lewis (b 1884), who invented "Vorticism." This

last is only one of the many 'isms' in modern art, all of which have had a few adherents in Britain. An early disciple of his was William Roberts (b 1895), whose unusual style has always added interest to his finely painted groups of lower-class types. The Camden Town Group later became the London Group, its leading lights in the post-War period being Duncan Grant (b 1885), who is still one of the more influential of British painters, and Vanessa Bell (b 1879), well-known as a fine painter of flower pictures and still life. Of sculptor members of this group, Frank Dobson (b 1888) is important, but his work and that of the far better-known Jacob Epstein (q.v.) are described in the article on Sculpture where also other advanced British exponents of this art are dealt with.

#### The 'Ultra-moderns'

Coming now to a group of painters whose work is in a still more modern manner, we find first the brothers John and Paul Nash. Paul Nash, the better-known, is a fine landscape artist, and as the founder of the short-lived "Unit One" he has been very influential. John Nash is also a painter of many fine outdoor subjects. Included in "Unit One," and perhaps the most discussed British painters of today, are Ben Nicholson and Edward Wadsworth. The former is the son of William Nicholson (b 1872), one of the famous "Beggar staff" brothers, who brought about a revolution in poster art, and who became famous for his colour prints, notably that of Queen Victoria. Ben Nicholson has taken to Surrealism (q.v.), and although his pictures are consequently beyond the grasp of most people, they have, none the less, a quality which marks them out as genuine and valuable landmarks in British art. Edward Wadsworth (b 1889), perhaps not quite so difficult to understand, is also a Surrealist. Equally unintelligible, to many people, is the work of Stanley Spencer, an artist who, unlike many of his contemporaries, is interested in his subject, not merely in painting. He is remarkable among the moderns for having devoted most of his time to depicting scenes from the New Testament, though he dresses his characters in the clothes, and puts them in the scenes, of his native country. He, like the Nash brothers, was greatly influenced by the World War. But of all artists who owe a good deal to the War C. R. W. Nevinson (b 1889) is the most remarkable, and many of his finest works belong to that period. Several books of his War pictures have been received with enthusiasm, they show Cubist influence and also that of the Italian Futurists. But he is the most versatile of modern painters.

Our strength in water-colour painting and other branches of art, and many of the artists, are described under their own headings.



## PRICELESS GEMS OF ENGLISH ART



Few portraits of husband and wife are so successful as this, in which William Hogarth has delightfully shown us the famous actor David Garrick and his wife. Hogarth's paintings apart from their great artistic merit are valuable to students of his times for the wealth of detail in costume and furnishing which he always supplies. This painting suffered somewhat from the artist's temperament for when his sitter criticized the work Hogarth in a fury disfigured Garrick's face in the painting the damage being only partly repaired later.

*National Gallery*

## REYNOLDS' LOVELY 'AGE OF INNOCENCE'



Although Sir Joshua Reynolds was primarily a painter of straightforward portraits and was at his best when dealing with men of his own age and type he produced some of his loveliest work when his sitters were small children. He had evidently some way of putting his small sitters quite at their ease and in this lovely study the master has caught to perfection the unconscious beauty of a little girl. But you can see in the foreground especially how his endless experimenting led to the use of materials which have deteriorated

*National Gallery*

## A 'TOUR DE FORCE' BY GAINSBOROUGH



This is one of the most famous pictures in the whole world—Gainsborough's 'Blue Boy'. It is said that the artist heard it reported that Reynolds considered that the greater part of a successful picture could never be blue. Determined to disprove his rival's point, Gainsborough dressed up his young sitter Jonathan Buttall, in a blue suit and produced this masterpiece. Done in 1774, this painting was sold in 1921 for a sum said to have been £150,000 to a collector in America, the sale causing some consternation in England.

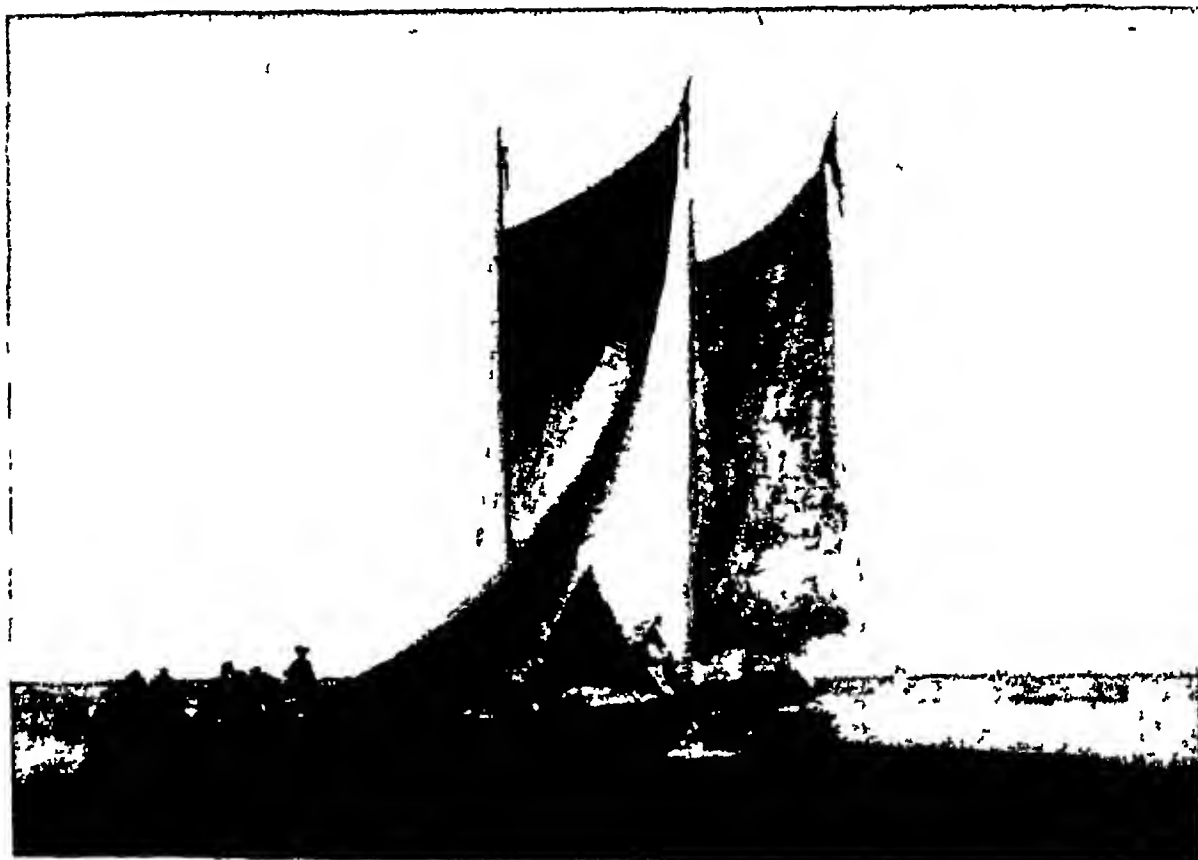
## REALISM IN A FAMOUS CONSTABLE LANDSCAPE



This picture, John Constable's *The Cornfield* is one of the best known of all English paintings for reproductions of it are to be seen everywhere. The secret of its popularity, like that of many of Constable's works, is probably to be found in the straightforward realistic treatment of an absolutely English scene which brings home to everyone who sees it the brightness and shadow of the country lane, the sun gleaming on the corn, and the village with its church beyond. This in fact is England.

National Gallery

## TWO MASTERPIECES OF MARINE PAINTING



What greater contrast could you find than that between these two paintings, both masterpieces of British art? Above is John Sell Cotman's 'Wherries on the Yare,' which makes an interesting comparison with Crome's somewhat similar painting in page 1501. Its smoothly constructed pattern in simple masses of colour looks strangely naive beside the masterpiece below, Turner's 'Ulysses deriding Polyphemus.' A typical work in Turner's later manner this picture fairly glows with colour.

National Gallery



TYPICAL EXAMPLE OF THE PRE-RAPHAELITES' REFINED ART

In Dante's Dream which you see here D G Rossetti, one of the founders and leaders of the Pre-Raphaelite Brotherhood produced a completely typical example of the group's peculiar art. Attention to detail accuracy of description and 'truth to Nature' were three of the points which the Pre-Raphaelites sought to make in every picture. Thus for the flowers you see here innumerable drawings from life must have been made and the same applies to every other detail. The models for most of Rossetti's female figures were his own sister the poetess Christina Rossetti and his wife formerly Miss Siddal. The painting above was done in the years 1870-81 it is now in the Walker Art Gallery Liverpool.



## THE ENGLISH SCENE BY OLD & MODERN MASTERS



Here you see the work of our first and our latest great landscape masters Richard Wilson and Wilson Steer. Above Richard Wilson's lovely 'View in the Wye Valley,' which is in the National Gallery shows well that master's spirit of quietude and reflection and one is surprised such is the breadth and largeness of atmosphere of this painting to hear that it is really quite a small picture. Wilson Steer influenced by Constable and painting in the Impressionist manner produces an altogether different, more lively and more exciting effect in his great 'Richmond Castle' (below). This is in the Tate Gallery.

## PAINTED BY JOHN'S VIGOROUS BRUSH



For all its simplicity, both of subject and of treatment you cannot help feeling that this is the work of a fine painter. It is Augustus John's 'The Orange Jacket,' a typical example of his best work. The strong colouring, simple drawing and brilliant handling of light and shade are features in which he always excels and which have helped to make him perhaps the best known modern painter in this country. Though not unaffected by various influences John has always been an artist of great strength and originality.

*Tate Gallery*

# STIRRING TALES of OLD ENGLAND

*This article continues the history of the English people from where the article Britain left off down to the Act of Union of 1707, by which England and Scotland were united The United Kingdom is dealt with separately*

**English History.** England is less than one fourth the size of France and only a little larger than Newfoundland Nevertheless, she claims as loyal subjects and fellow citizens one fourth of all the people known to be in the wide world—as the mother land of an empire “on which the sun never sets” War and commerce, the explorer and the colonist have all contributed to its up-building

Is England great because of her geography, or her soul? Did she conquer the physical facts around her, or was she made by them?

You cannot conquer physical facts any more than you can put your finger in the fire and not get burned Fire burns and you cannot change that fact, but you can use fire and make it boil kettles and run steam engines and steamships and factories That is the secret of England's greatness She used the facts of her history and geographical situation to build up her great power Let us see what these facts are that England harnessed to bring her to her present wonderful empire

Phoenician merchants from the Mediterranean came beating over the waves in long galleys rowed by slaves chained to the oars—through the narrow Strait of Gibraltar, up the Spanish coast, and on to a little unknown land only 21 miles across from Gaul (modern France) There they found strange, wild, blue eyed people, dressed in hides, with shields of skin so thick and hard that an arrow could scarcely penetrate These people wore leather sandals and leggings, and dyed or tattooed their bodies with a blue weed called “woad” They belonged to the race which we call Celts (Kelts) They themselves were styled “Britons” and the island “Britain” (See Britain)

What the Phoenicians wanted especially from Britain was its tin, so necessary in making the bronze tools and weapons used in that distant age Greek merchants from Marseilles (in southern Gaul) also visited Britain, and finally the Romans learned of it

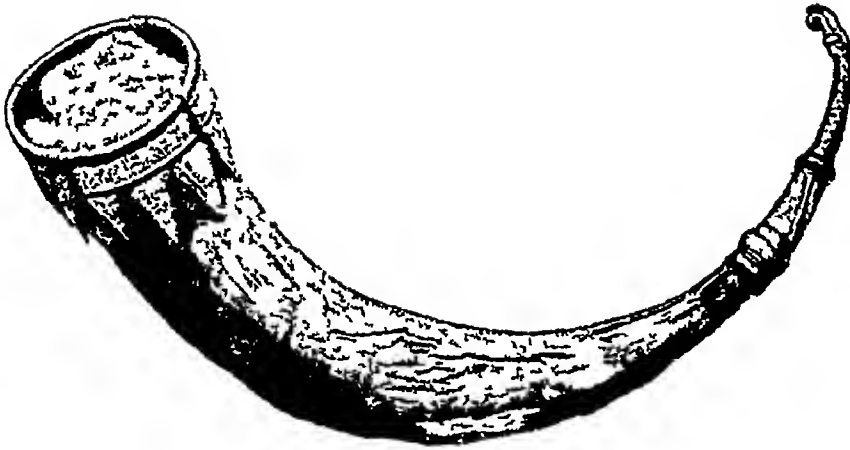
Julius Caesar (55 and 54 B C) was the first Roman to lead an expedition to these shores, and he did so because the Britons were continually coming across the narrow waters of the English Channel in cockle shell skiffs and helping the Gauls, whom Caesar was then striving to conquer His first landing was not far from the white cliffs of Dover

When Julius Caesar came on his second expedition he penetrated up the Thames to a muddy village where the Celts lived in thatch



**INVADERS OF ENGLAND'S SHORES**

When the Romans held England they left as their mark well-built roads, many of which have survived until the present day Here the brush of the artist has shown some of those who have travelled the Roman roads the British chieftain with his coat of skins, the Roman legionary, the Saxon thane the Dane with his horned helmet, and the Norman knight.



British Museum

### DRINKING VESSELS OF SAXON ENGLAND

The Teutonic races who conquered Britain were great beer-drinkers. The bronze-mounted drinking-horn (left) was found in the burial-mound of a great chief at Taplow, by the Thames. Probably he had to drink up his ale or mead at a single draught, for it was difficult to lay the vessel on the table unless it was empty. Such vessels were made from cows' horns, and were often two feet long. The bronze stoup on the right, of fine workmanship, was found at Long Wittenham, Berkshire.

roofed cabins surrounded by dank swamps and thick forests, near what is now London. But it was not until nearly 100 years after Caesar (A D 43) that the Emperor Claudius sent an expedition which began the real conquest of the island. Only the southern half was actually conquered and organized as a Roman province.

During this time obscure soldiers and traders introduced the Christian religion, and here and there arose its chapels. Then about A D 410 the last of the Roman legions withdrew, for Rome was now in conflict with hordes of Teutonic barbarians.

Left to themselves, the Britons found they had well-nigh forgotten how to fight, and were unable to unite under a single government. When their old enemies, the Picts and Scots, began to attack them, they were in despair. In a letter called "The Groans of the Britons" they wrote for aid to a Roman general, saying "The barbarians drive us to the sea, the sea throws us back on the barbarians. Thus two modes of death await us, we are either slain or drowned." From the Continent, too, came heathen sea-rovers of the German tribes—Angles and Jutes and Saxons—beginning their conquests about A D 449. In the course of the next 250 years the newcomers possessed themselves of the whole of "Angle land," or "England" (so named from the invading Angles).



### SAXON KING AND HIS THANES

This illustration, purporting to represent Nimrod the mighty hunter," actually shows an Anglo-Saxon king among his courtiers. It is taken from a manuscript copy of some religious poems by Cædmon, the Anglo-Saxon poet, whose story is given in page 758.

By permission of the British Academy

To keep back the savage Picts and Scots of the north, the emperor Hadrian (A D 122) built a great wall across the narrow neck of the island.

South of the Roman Wall, the Romans built numerous roads and several walled cities. They taught the Britons how to plant oats and barley and wheat, and the upper classes became Romanized. For more than three hundred years the Britons were under the civilizing influence of the Romans.

Everywhere, except among the Celts in Wales and Scotland, the Latin language, Roman civilization and the Christian religion practically disappeared. A Teutonic speech and Teutonic institutions—brought with them by the invaders—took their places. Christianity was soon introduced again, chiefly by the monk Augustine and his companions, who landed in Kent in the year 597.

Two centuries later (A D 829) the scattered English kingdoms were for the first time united into a single kingdom, soon to be made illustrious by the name of Alfred (See Alfred the Great).

## ENGLISH HISTORY

Danish raids and settlements troubled the land for over a century, but Alfred checked their advance, and his successors reconquered the "Danelaw" in which these Northmen were settled. In the 11th century there was a second wave of Danish conquest, and under Canute and his two sons the whole of England was for a quarter of a century under Danish rule (See Canute). But presently the old Saxon line was restored in Edward the Confessor.

### When the Normans Conquered England

Then in 1066 came the Norman Conquest. William of Normandy, claiming that he had been promised the throne of England, defeated and killed the elected King Harold at the battle of Hastings, and conquered the country. Half the land was divided among William's followers. Everyone who received or kept land directly from the king (the "barons") had to swear allegiance to him and supply him with soldiers. Feudalism prevailed (See Feudal System). But in the next 150 years the Normans became English. The old laws and customs and language of the Anglo-Saxons triumphed over the Norman French, though they were considerably

changed. By that time the Plantagenet kings, descended from the Conqueror's granddaughter, were reigning.

The kings never made new laws or managed to get money in new ways without consulting the Council of the leading men—a Saxon fashion. When King John tried to do otherwise, the powerful barons made him set his seal to Magna Carta (1215), which meant that no one, not even the king, had a right to break the law or change it without the Council's consent.

Then the Council became Parliament. Members elected to represent the bigger towns and the counties or "shires" were summoned to attend it, as well as the greater barons, whose right to attend was already established by custom. This change was given its final shape by Edward I in 1295. Soon after that Parliament was definitely divided into the House of Commons and the House of Lords (See Parliament). The Hundred Years' War with France (1338-1453) and the Wars of the Roses (1455-85) are described in separate articles.

When Columbus in 1492 discovered America for Spain, the Tudor king Henry VII sat on the



**THE DANES IN SIGHT! A SCENE IN ENGLAND'S EARLY HISTORY**

To our early ancestors, the Danish, or "Viking," sea-warriors were cruel, destructive enemies of the peaceful life which the Saxons loved. Every summer the Saxons watched their coast carefully, for it was then that the Danes made their raids. They knew that if the Danes spent the first winter among them, they had come for good, and "free us from the Northmen's fury" was the prayer they often uttered in church.

*From a painting by Herbert Bone*



## THE DEATH OF HAROLD, THE LAST SAXON KING

Pierced through the eye by a Norman arrow, King Harold fell at Hastings in 1066. He might have won this battle, but he had just had to deal with the Norsemen at Stamford Bridge and his earls failed him in the hour of England's need. William the Conqueror's victory was commemorated in the Bayeux Tapestry, of which this illustration is a portion, and into which other events of that time were woven by order of William's half-brother Odo, bishop of Bayeux.

**English throne** This nation of sea rovers, with harbours opening on the Channel, on the Humber, on the Thames, on the Bristol Channel, with the love of the sea and the love of freedom in their very souls, took to the sea like ducks to water and seized upon the opportunities offered by the New World. London, although a great mart for traders, was little more than a mudhole sprawling on both sides of the Thames, Liverpool was a village, Bristol was a seafaring town of perhaps 10,000 people.



In 1588 something else happened in Europe to change this little island's destiny. England defeated the great Spanish Armada (see Armada, Spanish) through the leadership of those very sea rovers who already in the person of Sir Francis Drake had ploughed a silver furrow around the oceans of the world.

This left England mistress of the seas. The sea was her wall against attacks and wars which devastated continental Europe. Her greatness lay over the paths of the sea, and in the souls of her sons was the passion for freedom of a race that had learned to fight and die for the liberty of their land.

But wars and religious persecutions on the Continent were driving the suffering peoples abroad, and to many of these, under the influence of her own Reformation, England threw wide her gates as a port of refuge. Flemings had already come from the Netherlands and taught the English the arts of weaving, lace making, metal work, and watch making. Exiled French Huguenots carried to England

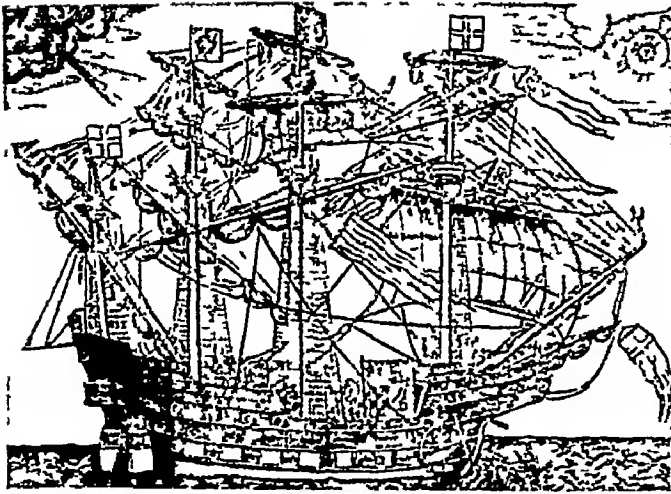
*The lower illustration is a copy of the original charter with King John's own seal on it.*

*The Magna Carta was some thing more than a treaty forced upon a tyrannical king by his discontented barons. It was the document which decided the principle on which Britain has been governed ever since. The lower illustration is a copy of part of the document. Above it you see a fragment of the original charter with King John's own seal on it. John did not sign the charter for he could not write.*

## MAGNA CARTA THE FOUNDATION OF ENGLISH LIBERTY

Magna Carta was some thing more than a treaty forced upon a tyrannical king by his discontented barons. It was the document which decided the principle on which Britain has been governed ever since. The lower illustration is a copy of part of the document. Above it you see a fragment of the original charter with King John's own seal on it. John did not sign the charter for he could not write.





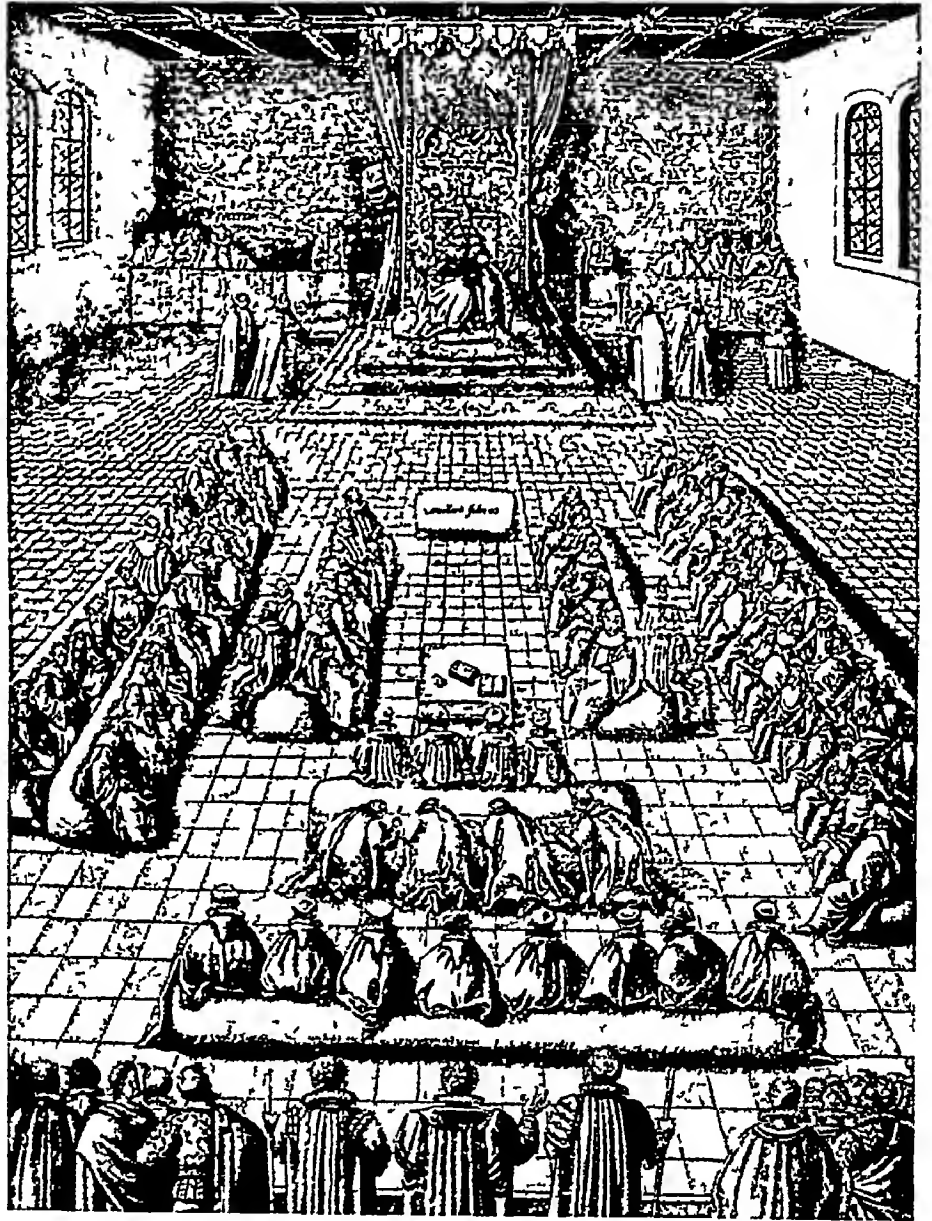
**A FAMOUS FLAGSHIP**  
"Ark Royal," of which a contemporary wood cut is here seen, was the flagship of Lord Howard of Effingham, admiral of the English fleet that routed the Armada

the secrets of French manufactures and hatred of their king, Louis XIV. Jews from as far east as Constantinople re-established themselves in England in the days of Cromwell, and helped to make London a centre of banking.

At the death of Queen Elizabeth England had attained a position of great prosperity, and she added to her strength by uniting with Scotland in 1603, in which year Elizabeth was succeeded by James VI of Scotland, the great grandson of Henry VIII's elder sister Margaret. King James sometimes tried to exercise the power of overriding the law by "divine right," though a wholesome fear of being driven to fighting kept him from overstepping the limits of English endurance. Nevertheless, he destroyed utterly the basis of mutual goodwill between the crown and the people, which had been the founda-

tion of the Tudors' apparently despotic authority. Charles I reaped the bitter fruits of his father's theories. The Parliaments of the Stuarts were only too ready to quarrel with the monarch. Charles gave them ground by entrusting the direction of policy to his favourite, George Villiers, Duke of Buckingham, by standing on what he regarded as his legal rights of raising revenue without the sanction of Parliament, and by repressing toleration of religious doctrine and observance, enforcing his will through the courts of Star Chamber and High Commission.

In 1628 Parliament compelled the king to accept the Petition of Right,



**JAMES I AND HIS PARLIAMENT**

This old engraving shows King James I enthroned in the House of Lords, who at that time were separated from the Commons only by the barrier you see in the foreground. Round the Chancellor's seat in the centre, earls, barons and bishops are grouped. The middle figure with his back nearest us is the Speaker.

BRITISH MUSEUM

## VICTORY FOR CROMWELL: DEATH FOR THE KING



Cromwell first proved his real mettle as a commander on the field of Marston Moor. This Puritan soldier and statesman, sworn enemy of royal and ecclesiastical tyrants, organized his Ironsides with rigorous discipline, and inspired them with a devotion which rivalled that of the Royalists for Charles. As the Civil War progressed, Cromwell became the second-in-command of the Parliamentary army, and later reorganized it on the lines of the Ironsides. In June, 1645, was won his great victory over the King at Naseby. This painting of Cromwell on his white horse on the field of battle is by Charles Landseer.



After his defeats at Marston Moor and Naseby, King Charles's hopes of victory began to fade. Finally, he gave himself up to the Scottish forces at Newark, and was by them returned to their allies, the English Parliamentarians, who kept him virtually a prisoner. At last, following "Pride's Purge," the Commons brought him to trial in Westminster Hall. He was condemned to death on January 27, 1649, although he refused to acknowledge the jurisdiction of the court. In this picture by Sir John Gilbert he is shown making his departure after the verdict.

*Maplin Art Gallery Sheffield*

but this failed of its precise purpose—the accurate definition of the royal prerogative. Eleven years of arbitrary rule without Parliament were ended in 1640 by the arming of Scotland—an independent kingdom to whose king accident had given the crown of the neighbouring kingdom of England.

The Long Parliament, instead of aiding him against the Scots, proceeded to force the king to accept a series of enactments abolishing the arbitrary courts and depriving him of the disputed prerogatives. A *coup d'état*, the attempted arrest of five members on January 4, 1642, failed completely. The king left London, and after several months of futile negotiation the Civil War opened in August, 1642.

After some indecisive fighting and skirmishing the army of the Parliament was reorganized by Oliver Cromwell and won the great victory of Naseby on June 14, 1645. Charles surrendered to the Scots, who had associated themselves with the cause of the Parliament, in May, 1646, was handed over by them to the Parliament in February, 1647, and was carried off into the custody of the army on June 3. From his confinement he intrigued with his own supporters and negotiated with three separate groups—the chiefs of the Parliament, those of the army, and the Scots—each of whom now had different objects in view, but in playing these off against one another he failed to recover his ascendancy. His attempt to escape to France, coupled with Cavalier insurrections, and a Scots invasion in 1648, threw the control into the hands of the victorious army, and determined its chiefs that the king's death was necessary. An arbitrary court condemned him to death, and he was executed, January 30, 1649.

England was now proclaimed a Commonwealth. The Scots recalled the prince who was the rightful Charles II, but the Commonwealth could not have the claimant to the throne of England seated on the throne of Scotland. A war with the Scots culminated in Cromwell's victory at Worcester (September 3, 1651), but Charles made his escape from the country. The remnant, or "rump" of the Parliament, which



BLAKE COMMISSIONED BY CROMWELL

Of all the long line of men who, by their skill and daring, made England mistress of the sea, Robert Blake, who is here seen receiving his commission from Oliver Cromwell, in 1649, as commander of the Parliamentary fleet, is one of the most striking and picturesque. On one occasion with 20 ships he defeated the great Dutch Admiral Tromp with 45. On another, with only 40 ships, half of which were useless for want of men, he fought Tromp, who had 80 fighting vessels and 10 fire-ships and withdrew undefeated, then, later, defeated Tromp in a three-day battle. His last and greatest feat was the destruction in 1657 of the Spanish treasure fleet which each year carried the gold and silver of the Americas to Spain.

had constituted itself the sovereign body by its own authority, sought to transform itself into a permanent oligarchy, with the result that it was forcibly ejected by Cromwell in April, 1653, and from that time Cromwell was virtually the absolute ruler of England.

Cromwell's government was necessarily arbitrary, but it strove at least to be as just as the circumstances permitted, while his vigorous Imperial policy made England feared on the Continent as she had never been feared before. With Cromwell's death in 1658 came chaos,

## ENGLISH HISTORY

and it was with practically unanimous satisfaction that Charles II was recalled to the throne in 1660

But the Restoration did not mean the triumph of the Stuart idea of monarchy. The country intended Parliament to be predominant, and, as far as concerned legislation and taxation, the king found that it was neither to be cajoled nor overridden. And Parliament, rendered by the arbitrary Puritan rule of the Commonwealth intensely hostile to Puritanism, proved no less hostile to Romanism, much to the surprise and disappointment of Charles, who had promised himself and his cousin, Louis XIV of France, the restoration of a Romanist ascendancy in the country.



**JAMES II'S FLIGHT TO FRANCE**

England was soon tired of James II's despotic and unpopular methods, and in 1688 invited William of Orange to take the throne instead. This engraving by Romeyn de Hooghe shows James embarking at Whitehall on his second attempt to fly to the Continent, which William did not hinder.

Under the mask of frivolity, however, Charles concealed an invincible determination to avoid openly fighting with Parliament, but to make himself entirely independent of it by secretly selling himself and his country to the King of France. For twenty-five years he successfully deceived statesmen, courtiers, politicians, English and foreign, and the King of France himself. On March 28, 1681, with Louis XIV's money in his pocket, he dissolved his last Parliament at the moment when its leaders imagined that he was fast in their grip. In twenty-one years he had built up a standing army sufficient for his purposes. In the following years he cancelled and renewed the charters of the boroughs in such a way that the Crown had

virtually absolute control over the Parliamentary elections.

Charles had secured the succession to his Roman Catholic brother, James. His death left James II with all the master cards in his hands, but he did not know how to play them. The loyalty of the country was turned first into uneasiness, and then into grim hostility. When he alienated ardent Royalists and fervent Churchmen by arbitrarily suspending or overriding the law in order to advance Romanism, men of every party joined in calling to their aid his son-in-law, William of Orange. William landed in Tor Bay, November 5, 1688. James took flight, and on February 13, 1689, William and Mary were proclaimed king and

queen of England, having accepted the Declaration of Right which laid down what were to be in future the fundamental limitations of the power of the Crown—limitations which were put forward as the historic right of the people. Scotland followed suit, and the crown remained united.

The accession of William, the lifelong enemy of Louis XIV, carried England into the midst of international fighting. The ascendancy of the English navy, long disputed by Holland and now for a moment challenged by France, was decisively established. The right of Parliament to fix the course of the succession to the throne was established, the state system of finance was reconstructed by the

creation of the National Debt and the Bank of England.

William died March 8, 1702, at the moment when he had organized the Grand Alliance which was plunging England into the War of the Spanish Succession. He was succeeded by Anne, the second daughter of James II, under whom that war was fought out to its end. But another issue had arisen. Scotland demanded a permanent union with England upon terms which would be agreeable to herself. On May 1, 1707, the Act of Union came into effect. From that hour the history of England as a sovereign state is merged in the history of Great Britain. In this book it will be found under the heading of United Kingdom.

# A PAGEANT OF ENGLISH HISTORY



The first people from the Mediterranean to trade with England were the Phoenicians. Their country was the narrow land, north of Palestine, between Mount Lebanon and the sea. Their skill as shipbuilders and navigators gave them a supremacy over all rivals in seaborne commerce, they alone among seamen passed out of the Mediterranean, and by the 5th century B.C. they had coasted along France and Spain and had even penetrated as far as the Baltic. In the course of their voyages they discovered the 'Tin Islands'—the Scilly Isles and Cornwall—and traded with the early Britons. In this picture by Lord Leighton Phoenicians are bargaining with a Cornish family.



## KING ALFRED THE GREAT IN THE DANISH CAMP

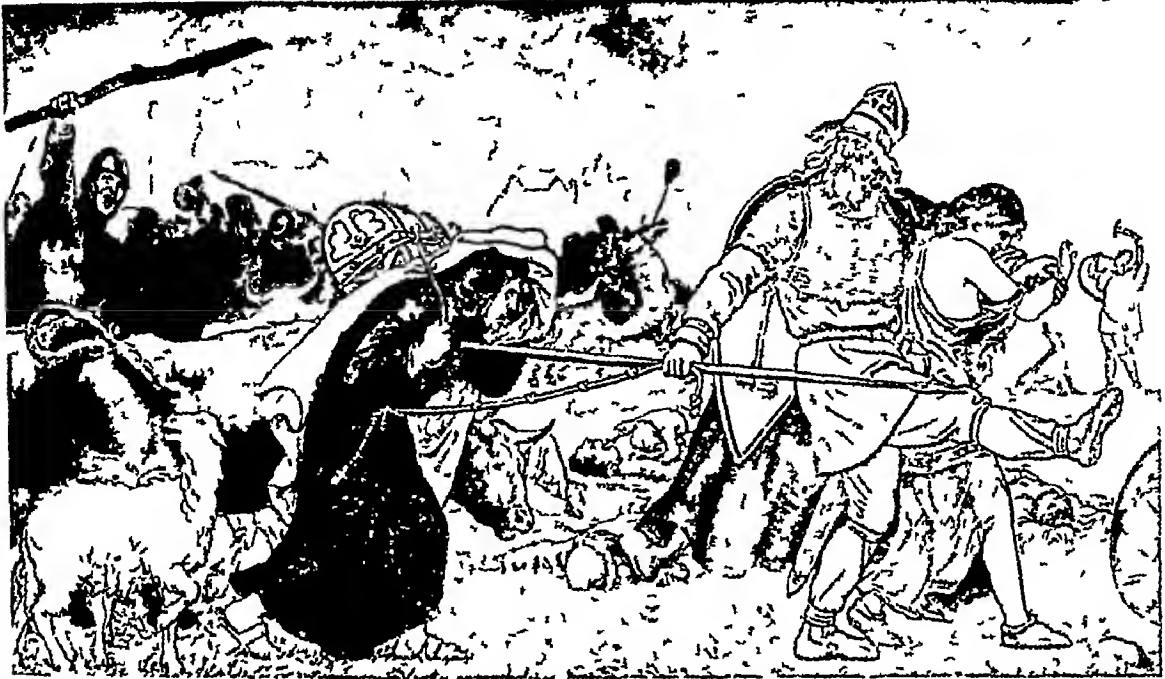


Many legends and stories have centred round the name of Alfred the Great, and one of them tells how he himself spied out the strength of the Danes. Disguised as a minstrel and carrying a small harp, he penetrated in'to the Danes' camp and wandered about entertaining them with his simple songs and melodies. The Danes were so delighted with his minstrelsy that they were loath to let the king go, but when at last he got away he knew the strength of the Danish army and the plans of its leaders. Returning to his own people he gathered a fresh army and defeated the Danes in battle.

*From the painting by Bone*



## VICTORY & DEFEAT OF THE VIKING INVADERS



After their landing in East Anglia the Danes gradually forced their way westward. This picture by Lorentz Frølich shows the sacking of Tavistock by the invaders in 997. The magnificent Abbey was burned and the people were robbed of their goods and livestock, and many were carried captives to the Danish camp. Five years later the long-suffering natives retaliated in a great massacre of the Danes in Wessex.



While the Danes were in England there was frequent fighting between them and the Saxons. Manchester, which was originally a Roman fort, became an early English settlement, but was taken by the Danes. Years of strife followed until in 923 the Danes were finally driven out. The fighting during the expulsion is vividly shown in this famous painting by F. Madox Brown. From the window of the house a woman is pouring boiling water on the fleeing enemy for though the weapons of those times were primitive no device that could injure the foe was neglected by the defenders.



## THE CONQUEROR GRANTS LONDON ITS CHARTER

After the defeat and death of Harold at Hastings, the people of London acknowledged Norman William as king. At this ceremony of homage to their royal master, 'William the Bishop and Gosfrith the Portrieve' are receiving the new London charter from the Norman Conqueror. William's wife, the princess Matilda, of the Anglo-Saxon royal line, is on his right.

*From a painting by J. Seymour Lucas in the Royal Exchange, London*



## *KING JOHN SIGNING MAGNA CARTA*

The foundation of English liberties was the Great Charter which was drawn up after years of revolt and fighting between the barons and King John, and was based on the series of demands that the barons had presented to the king. On June 15, 1215 John met the barons in conference at Runnymede, a meadow between Windsor and Staines and accepted their demands. This illustration shows King John just before the charter was sealed.

## ILL-FATED CHARLES STANDS ON THE SCAFFOLD



Charles I's trial, condemnation and beheading followed in quick succession. As at his trial, so in his last hours he displayed remarkable dignity. He crossed from St. James's to Whitehall, and at the hour of execution stepped on to the improvised scaffold from a window of the Banqueting Hall. Troops were assembled in front, and behind them stood the sorrowing people who were too far away to catch the last words of the king. In the picture, the executioner is waiting while Charles converses with Bishop Juxon to whom he entrusted his last mysterious message, "Remember!"

*From a painting by E. Croft*

## TRIUMPH & FAILURE OF THE LAST STUART KINGS



After many years of exile Charles II landed at Dover when his restoration had been made possible by the Declaration of Breda. The king set sail on a warship, the *Naseby*, renamed the *Royal Charles*, on May 24, 1660, and landed at Dover on May 26. This engraving after a picture by Benjamin West shows General Monk receiving Charles on his landing.



The arrest, trial and acquittal of the seven bishops in 1688, and the rumour that the king was trying to impose on the people as his son a child who it was said, had been brought into the palace in a warming pan finally turned public opinion against the last of the Stuarts. Leaders of all political parties combined in offering the crown to William of Orange, Stadtholder of Holland, James II's nephew and also his son-in-law. William accepted the invitation, and this picture by E. M. Ward shows the scene in the Palace of Whitehall when the news of his landing was broken to the king.

## GLORIOUS REVOLUTION' AND 'ACT OF UNION'



Though he was hailed as a deliverer from the tyranny of James II, William's succession to the throne of England was not approved until after long discussion at a convention parliament, and he had agreed to a "Declaration of Rights". This engraving shows the presentation of the crown to William, beside whom sits Mary the joint sovereign.



Commissioners from the two kingdoms of England and Scotland drafted the articles of Union and finished their work in 1706. By the Act of Union of 1707, the Scottish parliament was abolished. Henceforth Scottish representatives were to be sent to Westminster, 16 to the Lords and 45 to the Commons. Scotland, however, retained its own laws and courts of justice. By separate acts, incorporated with the Act of Union, it was provided that the two Churches should remain independent. In this illustration Queen Anne is seen in council, being presented with the articles of union.



**English Language.** There is an old saying in Europe that Italian is the language to use when you want to sing, French when you want to make love, and English when you want to do business. This is only a popular saying, of course, and not more than half true, but it does show that languages have different characters, just as people have, and that each one has a different taste to the mind.

It is true enough that English is a good language in which to do business, for probably the greater part of the world's commerce is conducted in English. But English is good for many other uses besides business. Indeed, it is one of the richest languages spoken today, with more variety than almost any other, and it is spread over a greater part of the earth's surface.

English is made up, like the people who developed it, of many national inheritances and foreign importations, and its history and growth make a very interesting study.

#### The 'Layers' of Our Language

Have you ever dug a hole beside a stream and seen the different layers you find as you dig—sand and gravel and small stones one above the other? If you look well into the English language you will find that it was formed in much the same way.

Of course, the words are all mixed together, so that often in a single sentence you will say words that come from all the different layers. If you say, for instance, "My mother received a good telegram," you have used words from four different sources. "Mother" is a very old word and comes from the original Indo-European root language, "received" is a word of Latin origin, "good" is a Teutonic or Anglo-Saxon word, and "telegram" is from the Greek.

English is classified as a Teutonic or Germanic language. This is not because more of our words are Teutonic, but because the Teutonic words are the framework of the language, the connecting words and the simple fundamental names of ordinary things. So that, in spite of the fact that only one fourth of our words in the dictionary are Teutonic, in ordinary speech about four fifths of the words we use are Teutonic. Another reason is that we put our words together with the grammatical construction of the Teutonic languages.

After the Teutonic words the most important are the words of Latin origin, which have come to us either from the Latin direct, or through the French or Italian or Spanish, but especially the French. These words have a different feeling from the Teutonic words when you know them. They are more polished, more stylish—you might say, more precise. The Normans, who spoke French, came over and conquered England and ruled over the Teutonic people, the Anglo-Saxons, who lived here. So it came about

that the words the common people used stayed Anglo-Saxon or Teutonic and the words of the wealthy and ruling classes became Latin.

For instance, as long as a sheep was alive and was tended by the shepherds, who were common people, it was called by the Teutonic word "sheep," but as soon as it was cooked and came on the table of the noble classes, it became "mutton," a French word. In the same way, "cow" is Anglo-Saxon, and "beef" is French. "hog" is Anglo-Saxon, and "pork" is from the language of the conquerors. The influence of the Church, the classical Renaissance of the 16th century, and the later coming of scientific terms from the Latin greatly increased this element in English.

One great advantage which English has over many other languages is the ease with which it forms new words out of old by simply joining them together, as in "rainfall," "railway," "backslide," "outcome," "daisy" (from "day's eye"). It is also rich in prefixes and suffixes which can be added to existing words to modify their meaning.

Thus we form nouns by the use of such suffixes as *-ness*, *-dom*, *-age*, *-tion*, *-ment*, *-or*, giving us such words as "wickedness," "kingdom," "breakage," "accusation," "amazement," "actor." The suffixes *-al*, *-ic*, *-ous*, *-able*, *-ful*, etc., are used to form adjectives, as "critical," "pedantic," "famous," "approachable," "tuneful." The prefixes *anti*, *pro*, *re-*, *inter-*, *in*, and a host of others enable us to make such useful words as "anti-vaccination," "pro vaccination," "reclassify," "intermarry," "unnecessary."

#### 'Stronger' Words of Teutonic Origin

In general the words of Latin origin are not so strong or so full of meaning as the Teutonic words. For instance, the Anglo-Saxon "friendship" has its Latin equivalent "amity," which means just the same thing, but it is a pale word and not nearly so good for most purposes. In poetry, where the colour of words is very important, Anglo-Saxon words are usually better than Latin words. But the Latin words have the advantage of being more exact.

The Greek words are much fewer in number and are largely scientific words, like "geology." We have a number of Dutch words, particularly about the sea, like "schooner," Scandinavian words (mostly from the old Danish conquest), like "earl," "window," a few American Indian words, like "tomahawk," a good many from the Arabic, like "alcohol," and an assortment of odd words. We have a few words invented to describe new things, like "television" and "aeroplane," and others, like "buzz," "splash," "cluck," are imitations of the sound of things. Some words, too, are names of people, like "sandwich," which came

from the Earl of Sandwich, who was too busy gambling to eat regular meals

The language of the old Britons was Celtic, and traces survive in modern Welsh, still the tongue of Wales. When the Romans conquered England they introduced a certain number of Latin words in the three centuries that they ruled the island. But when the Anglo-Saxons came over from the north of Europe, they brought with them their own Teutonic language, which is the basis of English, and there was very little admixture of Celtic and Latin from the conquered inhabitants. The earliest written examples of this Anglo-Saxon language are from the 7th century.

The periods in the development of the English language are called Old English (or Anglo-Saxon), Middle English, and Modern English. Old English was spoken until about A.D. 1100, and was very highly inflected—that is, it had a complicated system of grammatical changes to

indicate case, number, person, tense and the like. Middle English was spoken from about 1100 to about 1500, and was much less highly inflected, and Modern English, which has developed since 1500, has lost its inflections almost entirely.

There have always been—and are today in fact, though now they are only dialects—three varieties of English spoken in England—Northern, Southern, and Midland English. Northern English was important in the very early days and later developed into the Scottish dialect, such as you find in Robert Burns' poems. Southern English was the most important in the Old English period, especially under King Alfred. Modern English developed out of Midland English in the Middle English period. The poet Chaucer, who wrote in Midland English, and the Authorized Version of the Bible and the English Book of Common Prayer did much to set Modern English in the form it now has.

## Our GOLDEN STORE of PROSE & POETRY

*From Chaucer to Shaw the sky of English literature is studded with stars to which all the peoples of the world look with admiration. Here is a guide to this national treasury to which we are all heirs.*

**English Literature.** Nearly fifteen hundred years ago, when the Angles and Saxons still lived in Jutland and along the

WILLIAM  
SHAKESPEARES  
COMEDIES,  
HISTORIES, &  
TRAGEDIES.



Title-page of the "First Folio" (1623) edition of Shakespeare

North Sea shores, and spoke a Teutonic language that no one can read now without special study, English literature was born in somewhat humble circumstances. In the middle of the 5th century these peoples—the Anglo-Saxons—came to Britain, conquered the Celtic inhabitants and drove them westward. They brought with them tales in verse, sung by wandering minstrels. "Beowulf," one of these anonymous tales, was finally written down by some unknown scribe, and thus becomes the first landmark in English literature. The first poet whose name has come down to us was Caedmon, a labourer in St. Hilda's monastery at Whitby, Yorkshire, who made a metrical translation of parts of the Scriptures about the year 670. The greatest prose writer in Anglo-Saxon was King Alfred, who translated Latin text books for his people and started the "Anglo-Saxon Chronicle." Among his translations is an English version of Bede's "Ecclesiastical History."

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The Normans, who conquered England in 1066, brought with them the French language. But, being of the same original stock as the English, they gradually united with them, and the language of the country became English, modified and enriched by French. Wycliffe's translation of the Bible (1380), the most important prose work of the 14th century, set a standard of English prose and made it the people's language of religious thought. During those years while the language was forming, the old Welsh legends of King Arthur became popular, chiefly through the Latin writings of Geoffrey of Monmouth, a Welsh monk and chronicler. To the same century belongs "The Vision of Piers Plowman," by William Langland.

### The Father of English Poetry

Geoffrey Chaucer (1340?-1400) is England's earliest great poet. He belongs to the spring time of English poetry. His best known work, "Canterbury Tales," gives us pictures of people who lived in England then, all journeying on a pilgrimage in April, telling stories to pass the time, while—

smale fowles maken melodye  
That slepen all the night with open eye  
and the fresh and charming English countryside blossoms around them in all its beauty.

The years of the fifteenth century, after Chaucer, though they showed in England no important writings, were a busy time of preparation. All Europe was awakening to the renewal of classical learning, for the Greek and



#### NOAH'S ARK IN A SAXON BOOK

To Caedmon, Anglo-Saxon poet of the 7th century, are attributed the Biblical poems which were collected about A.D. 1000 in the "Caedmon Manuscript." Here is Noah's Ark, drawn like a Saxon warship by the 11th-century illustrator. By permission of Sir Israel Gollancz, and the British Academy.

Roman literatures lost to western Europe for nearly a thousand years, were now brought to light. The invention of printing, brought to England by William Caxton in 1476, made it possible to spread books and knowledge far and wide. The world was growing larger, too, for that century saw the beginnings of the age of geographical discovery. Other fearless men were seeking truth in religion, and the Reformation was being prepared.

In England the New Learning was represented by the famous Dutch scholar Erasmus (who came to England in 1497), by John Colet, the learned and lovable Dean of St. Paul's, and by Sir Thomas More. More's "Utopia," though written in Latin, reflects English thought about society and religion. The Reformation worked great good to the English language, for William Tyndale's translation of the Bible helped to fix the standard of English speech and literary style. There was little new poetry in that time, but Caxton's printing press spread broadcast the works of Chaucer and other native poets of merit. Caxton printed, too, Sir Thomas Malory's "Morte d'Arthur," an English prose translation of Arthurian legends compiled from French sources. In the lowlands of Scotland some poetry was written, the best by William Dunbar, and this Scottish strain,

with its warmth of feeling and love of Nature, was a powerful influence on the writers of a later day.

All these new influences—renaissance of learning, religious reformation, travel, discovery, invention—worked rather slowly on English literature. But in Elizabeth's reign (1558–1603) they flowered in the most wonderful creative period in the history of English writing. Poems, ballads, masques and pageants, the ancient classics and new romances and verse forms brought home by travellers in Italy, stories of voyages, books of religious reform, the Bible in English—all supplied inspiration, and England became a land of poets.

Edmund Spenser's "Faerie Queene" finely embodies the wonder, freshness, and beauty of the age, with nothing ugly or coarse. It is a long story-poem of the adventures of the Red Cross Knight and other knights who personify the virtues fighting against evil.

#### Development of the Drama

For centuries the drama had been growing up gradually, through the "mystery," "miracle," and "morality" plays presented to teach the people Bible stories, the lives of saints and the moral virtues. The real English drama began to appear in the later sixteenth century, with a group of powerful playwrights. One of these men, Christopher Marlowe, whose most famous works are "Tamburlaine the Great" and "The Tragical History of Doctor Faustus," was probably the greatest pioneer in English literature, and it was to him that Shakespeare owed more than to any other man.

Shakespeare, the greatest dramatist of all time, "touched life at all points," and something of what he saw and felt went into his plays. King and queen and peasant, wise man and fool, of his own time and of the past, walk before us. We sound the depths of human tragedy in "Hamlet" and "King Lear"; revel in fairyland



#### ILLUSTRATION TO SPENSER'S POEM

Dedicated to Sir Philip Sidney, but published under the modest pen-name of "Immerito," Spenser's "Shepherd's Calendar" (1579) contains a suitable "eclogue" for each month. Rugged "February" (the illustration to which in an early edition of the poem is seen above) is full of rustic and archaic language, harsh as winter, yet melodious.

British Museum



#### A COMMAND PERFORMANCE OF SHAKESPEARE

In Queen Elizabeth's day the sovereign and court never visited the rowdy theatres which were the haunts of pickpockets and breeding grounds for the plague, but, as in our times, command performances were given before the Queen in her palace. Here you see William Shakespeare reading a scene from 'Macbeth' to the Queen among whose ladies of honour may be the 'dark lady of the sonnets'.

in "A Midsummer Night's Dream", laugh up roars with Falstaff in "The Merry Wives of Windsor", and wonder at the peaceful beauty of "The Tempest". Shakespeare touches every emotion and speaks to all times and nations. Through him England reached its supreme poetic expression.

After Shakespeare's death drama and poetry greatly declined. Ben Jonson wrote carefully wrought plays and lovely songs, Beaumont and Fletcher were dramatists with flashes of extreme vigour and beauty, but none had the gift of supreme genius.

#### Letters in the Time of Bacon

The times of James I and Charles I, in which the Elizabethan impulse largely persisted despite the rising tide of Puritanism, produced many beautiful lyrics, such as those of Herrick, Lovelace, and Suckling. George Herbert and George Wither found inspiration in religion. The most important prose writer of the period, the one who still speaks to us as forcefully as he did to those in his own time, was Francis Bacon, whose deep, penetrating "Essays" will "live as long as books last," as he himself foretold. Bacon also originated the new method of the scientific research based on experiment which has helped the wonderful progress of modern science.

The Puritan standards in religion, morals and government, which had been gaining power, at last prevailed in the Civil War (1642-1648)

between Crown and Parliament. In the main the Puritan age which followed was more favourable to the development of prose than of poetry, for philosophy, religion and government were constant subjects of thought and controversy. Yet, though the age was one of argument and contention, it produced Milton, who stands next to Shakespeare in the galaxy of the greatest English poets.

In his beautiful early poems, like "Il Penseroso" and "L'Allegro," Milton's genius is more akin to the spirit of the Elizabethan age than to that of his own time. In his "Areopagitica" (on the freedom of the Press) and other prose writings, he serves the cause of liberty. In his sublime "Paradise Lost" he expresses the Puritan spirit at its loftiest and best. It is England's great epic poem, written in the noblest of blank verse.

Another great Puritan, who stands with Milton as a representative of the age, was John Bunyan, the nonconformist preacher, who wrote "Pilgrim's Progress." This story of Christian's journey from the City of Destruction to the heavenly country is an allegory full of meaning and charm for children and simple people as well as for wiser folk. It has been translated into more languages than any book save the Bible. Three quaint books of the time, sometimes read now for their wisdom and pleasant fancy, are Robert Burton's "Anatomy of Melancholy," Sir Thomas Browne's "Religio

Medici," and Izaak Walton's "Compleat Angler," called "The Bible of Fishermen."

With the return of the Stuarts in 1660, and the removal of Puritan restraints, some forms of literature showed a natural reaction. The drama especially reflected the loose living and frivolity of the court life. The more serious poetry and prose underwent great changes. Writers felt less and had less to say, so they gave less attention to *what* they said than *how* they said it, emphasizing especially simplicity and directness of style. Their subjects were mainly social and political.

John Dryden, "the greatest man in a little age," led in the new poetry. His "Absalom and Achitophel" is the greatest political satire in the language. Dryden also wrote plays, but his great influence has been through his masterly critical essays, which were among the most weighty factors in the formation of modern prose style. Samuel Butler's "Hudibras" was a fiercely satiric poem against Puritanism. In their diaries Evelyn and Samuel Pepys give "the very taste and colour of life" in their times. There were also far-reaching developments in science, and the Royal Society was incorporated in 1662. Sir Isaac Newton's "Principia" began a new age in science, while John Locke's "Essay Concerning the Human Understanding" opened new fields in philosophy as his "Essays on Government" opened new fields in political thought.

#### England's Augustan Age

In the early 18th century, under Queen Anne, standards of personal and political morality were low, and there was little left of the old Puritan loftiness of purpose. As in the preceding age, writers were weak in feeling and imagination, and turned largely to satire and criticism. But they laid increasing emphasis on perfection in literary form—clearness, smoothness, and regularity—developing a beautifully elegant and polished prose style. Because of this, the period is one of the great ages in the history of English literature.

Alexander Pope was the outstanding poet, brilliant in satire and criticism. In his "Essay on Criticism," his "Rape of the Lock," and his verse translation of Homer he used the rhymed couplet (then considered the perfect verse, for irregularity and lack of smoothness were counted barbaric faults). Such regularity seems monotonous now, but we still quote Pope for his concise and perfectly rounded sayings.

But the reign of Anne was pre-eminently an age of prose. The most original writer of the day and one of the most powerful satirists of all time was Jonathan Swift, author of "Gulliver's Travels," which bitterly and mercilessly holds up to scorn Man's faults and weaknesses. The periodical essay as developed by

Addison and Steele was a new form of writing, which held the germs of the modern novel, magazine, and newspaper.

These two men wrote for the "Tatler" and the "Spectator" essays on English life, morals and manners, ridiculing gently the failings of the age and bringing a tone of culture and good breeding into clubs, coffee houses and homes. Sir Roger de Coverley, the English country gentleman, immortalized in a group of the "Spectator" papers, is a well-loved book character. Addison's kindly humour and smooth elegance make his essays delightful reading.

The tone of Addison's work is one evidence of changes working in morals and literature. There was warmer feeling in religion, and great emotional preachers like Whitefield and the Wesleys soon were reaching the lower classes.



MILTON, THE MAJESTIC POET

Those steadfast eyes are unseeing. At the age of 62 Milton had been blind for 18 years. But his daughters and friends read to him, and took down at his dictation his "Paradise Lost," "Paradise Regained," and "Samson Agonistes." Engraving by William Faithorne. National Portrait Gallery.

Interest in romance and Nature reappeared, in the period 1740-80, in Macpherson's professed translation of the epics of the Gaelic Ossian, and in Bishop Percy's collection of old ballads, the "Reliques of Ancient English Poetry." Love of Nature animated the poems of William Collins, James Thomson, and Thomas Gray, author of the "Elegy in a Country Churchyard." Oliver Goldsmith's "Deserted Village" has both beauty and feeling, and his play "She Stoops to Conquer" is full of hearty fun.

The character studies of Addison and Steele, the stories of Daniel Defoe, author of "Robinson Crusoe," and the revived interest in old-time romance pointed the way to the new



form which today provides the greatest part of our literary pleasures—the novel “Pamela,” by Samuel Richardson, heads the list. Henry Fielding, Oliver Goldsmith, Laurence Sterne, and Tobias Smollett all added valuable elements to the new literary type, and their novels served as models for those that followed. Goldsmith’s “Vicar of Wakefield” (1766) remains popular.

Above the literary life of the time towers the huge bulk of Dr. Samuel Johnson, great conversationalist and arbiter of literature, compiler of the “Dictionary,” and author of “Lives of the Poets,” “Rasselas,” and many periodical

The old standards could not hold long in a time when men were thinking of freedom, when governments were changing, and the people were making themselves heard. Love of liberty animated all who thought deeply. Literature revolted from its old limitations and found free expression for thought and feeling.

William Blake and William Cowper were forerunners of a new outburst of poetry and prose. From Scotland, whose poets had long loved Nature and freedom, came Robert Burns, singing the new brotherhood and democracy, as in the line “A man’s a man for a’ that!”—

and the love of Nature, the tender sentiment, and the rollicking humour of his race, in poems like “To a Mouse,” “The Cottar’s Saturday Night,” and “Tam o’ Shanter.” Another poet of Scotland was Sir Walter Scott, who put stirring border tales into poems like “The Lay of the Last Minstrel.”

Greatest of all the Nature poets was William Wordsworth, who better than anyone else leads one to understand meanings hidden beneath Nature’s outward forms. To this modern day he speaks most effectively in his beautiful meditative short poems, and in his sonnets—like the one beginning “The

world is too much with us, late and soon.”

Samuel Taylor Coleridge wrote only a few truly great poems, but those few are unexcelled for imagination, penetrating vision and melody. “The Ancient Mariner” stands alone in magical rendering of the supernatural and fantastic.

The spirit of revolt that is the outstanding characteristic of the time appears in most intense form in the poetry of Byron. “Don Juan” and other fiery poems exercised immense influence on the younger writers of his day.

Most ardent of the young poets of liberty was Percy Bysshe Shelley. His longer poems soar into a spiritual region, whither not everyone can follow him. But we all can enjoy such exquisite



DR JOHNSON READS GOLDSMITH'S 'BEST SELLER'

Often the impecunious Goldsmith could not pay his rent, and here we see his landlady presenting her long overdue bill. She has just called in the sheriff's officer to arrest him, but fortunately Dr. Johnson (left) has discovered the manuscript of “The Vicar of Wakefield,” which he is going to take to a publisher, so that Goldsmith's difficulties will soon—temporarily—be solved.

essays, but his personal influence was far more potent than his writings. He, along with Sir Joshua Reynolds, founded a famous literary club, of which the statesman Burke, Goldsmith, Boswell, the historian Gibbon, and the great actor Garrick were members.

Johnson's style was ponderous and full of large, resounding words. His emphasis on classical severity and dignity held back some what the advance of the freer spirit of romanticism with its bold originality and rejection of ancient precedents. Happily (since the man himself is more interesting than his works) we have a remarkable biography of him by his friend and worshipper, James Boswell.



lyrics as "The Cloud" and the "Ode to the West Wind" Like his own "Skylark,"

Higher still and higher  
From the earth thou  
springest  
Like a cloud of fire

The other poet of this group was John Keats, whose early death Shelley mourns in "Adonais" Keats was deeply moved by the passionate love of beauty for its own sake Such short poems as "On a Grecian Urn" or "To a Nightingale" have unsurpassed beauty, and contain such music as—

hath  
Charmed magic casements opening on the foam  
Of perilous seas in faery lands forlorn.

In the same golden age Scott created the historical novel His *Waverley Novels*—"Ivanhoe," "The Heart of Midlothian," and many others—were the favourites of the age and were read all over Europe Another novelist was Jane Austen, one of the first to write, in "Pride and Prejudice" and other novels, interesting stories of commonplace people

Thomas De Quincey wrote voluminous essays in a beautiful and elaborate style Most lovable of essayists is Charles Lamb, author of the gentle, whimsical "Essays of Elia" He and his sister Mary retold "Tales from Shakespeare"

#### With Victoria Came Change

By the time Queen Victoria came to the throne a new age was producing new writers The idea of evolution changed the outlook of science and philosophy and affected religious thought (See *Evolution*) The spread of democracy was reflected in the poetry and prose of the time

The two chief poets were Alfred Tennyson and Robert Browning Tennyson wove the King Arthur stories into the "Idylls of the King," which together make a long poem, rich in meaning and imagery, melodious in language "In Memoriam" and "Locksley Hall" mirror the religious and scientific spirit of the day Browning wrote stirring narrative poems, character analyses, dramas, and love poems His wife, Elizabeth Barrett Browning, wrote the love poems, "Sonnets from the Portuguese"



WORDSWORTH AS AN OLD MAN

Wordsworth was 72 when Haydon, friend of Keats and other romantic poets, painted this portrait in 1842, the year in which "The Borderers" was published A year later, Wordsworth was chosen poet laureate  
National Portrait Gallery

The restraint of Greek art and the mental stress of the modern age were present in the poetry of Matthew Arnold The pre-Raphaelites, under the leadership of William Morris and Dante Gabriel Rossetti, frankly turned their backs on the present and addressed their poetry to the past Delectable music and a philosophy of pleasure were the essence of the over luscious poetry of Algernon Swinburne

Matchless among prose authors for clear, forcible, picturesque studies of great men was Macaulay Thomas Carlyle spoke directly, flamingly, to arouse people to thinking, in his "Sartor Resartus" and "Heroes and Hero Worship" John Ruskin, Matthew Arnold, and elegant

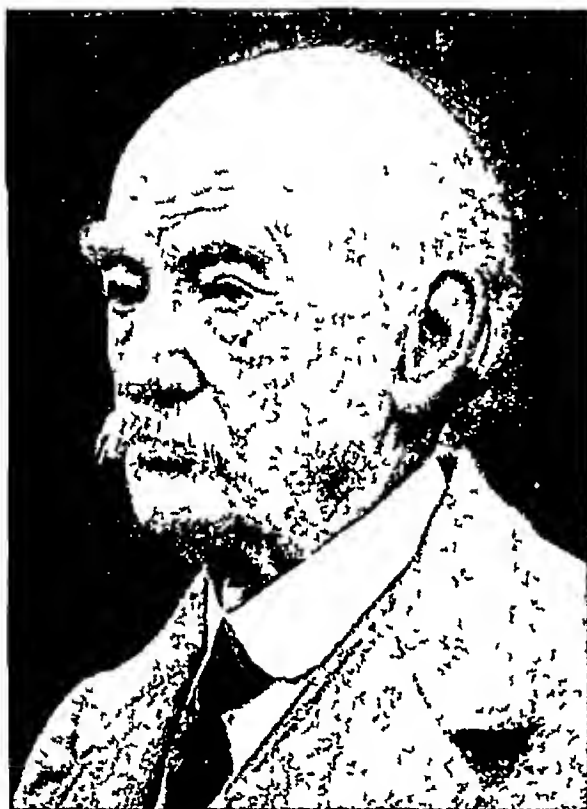


SHELLEY, POET OF THE DAWN

To Shelley, dawn symbolized the beginning of a new age in which Man could make himself perfect. This portrait was painted when Shelley was 27—three years before he died. His "Prometheus Unbound" had just been published  
National Portrait Gallery

Walter Pater form a group of critical writers of the first rank

Prose fiction was now the chief art form, and innumerable novels were written. Charles Dickens, author of "Pickwick Papers" and "David Copperfield," with his humour, pathos, and understanding of human nature, is one of the best-loved authors. William Makepeace Thackeray, the keen but kindly satirist of English life in "Vanity Fair" and "The Newcomes," is scarcely less a favourite. "Middlemarch," "Silas Marner," and the other novels of the great woman novelist, George Eliot, all have their problems and serious purpose.



**HARDY, NOVELIST AND POET**

Thomas Hardy studied architecture as a young man. This training probably influenced the fine structure of his literary work. His reading of Latin and Greek authors undoubtedly helped him to write, when nearly 70, his masterpiece, the epic drama "The Dynasts."

Anthony Trollope left an amazing series of novels depicting with wit and fidelity life in the clerical and "county" society of his day. Literary heir of Thackeray was George Meredith, whose brilliant novels, such as "The Egoist," illuminate the social scene with far more sharpness and pungency than did Thackeray's. Irresolute readers called Meredith's condensed flashing style "untelligible" and "obscure."

The great figure of the period was Thomas Hardy, over whose novels broods a dark, inescapable fate—the fate imposed on Man by his own nature, by all the forces of land, sea and sky. The power of environment, the clutch of

the past, wring pure tragedy out of the lives of "Tess of the D'Urbervilles," "Jude the Obscure," and all the other stumbling heroes and heroines of Hardy. In "The Dynasts" he showed surprising gifts as a poet.

Robert Louis Stevenson had a lighter touch, marked by a sedulously polished style and a wonderful gift for story telling. "Kidnapped," "Catriona," "Treasure Island," are swinging tales of adventure, the unfinished "Weir of Hermiston" (completed by Sir Arthur Quiller Couch) is among the finest of his stories, such essays as "Virginibus Puerisque," short stories and fantasies as "The Sire de Malétreit's Door" and "Will o' the Mill," and his verses for children never fail to charm.

All the ingredients of popularity were manifest in the swift, bright tales of Rudyard Kipling, in his marching or mocking verse, in "The Jungle Books," favourites of children. His imperialism is seen at its best in his descriptions of Britons at work in distant territories.

#### **Influence of H. G. Wells**

Changing views of the social order have sifted the dust of theory, propaganda and sociology over a good bit of 20th-century fiction. H. G. Wells began with several first-rate tales, such as "Tono Bungay," and ended as an inexhaustible evangelist of social theories, a fountain of ideas, suggestions, conjectures. His "Outline of History," intended to establish a new attitude toward history rather than to present new facts, had a tremendous vogue.

The "what's-wrong-with-the-world" theme also animated the novels of John Galsworthy. "The Forsyte Saga" is a humourless, thoughtful and well-made series of novels about one family, in which he sketches an upper stratum of English pre War and early post War life.

Arnold Bennett, who liked a good story better than propaganda, nevertheless struck many a neat blow at human stupidity and pride in "The Old Wives' Tale" and "Riceyman Steps," the cream of his work.

Joseph Conrad had nothing of the reformer in him. He let the reader make what he liked of the moving pageant of the world, set down as if by magic on the pages of his sea tales, his narratives of political intrigue, and his glowing stories of the tropics. Master of English style, this Pole wielded a foreign tongue with a power which few Englishmen have equalled.

Fantasy of a delicate sort charmed readers and audiences in the stories and plays of Sir James Barrie. Maurice Hewlett accomplished the difficult feat of making historical characters live in his romantic novels of the past.

No writer impressed his time more strongly than did Bernard Shaw, whose flashing, stinging prefaces to his challenging plays pricked Victorian smugness. An Irishman of equal wit

but of a very different stamp was George Moore. His exquisite prose suggests both music and fine embroidery. Whether he made use of a political or religious idea, or whether he chose a historical theme, he produced a work of art in a severely simple and almost flawless English.

A third remarkable Irishman, James Joyce, created in "Ulysses" what has been called the most influential single work of the 20th century. It records 24 hours in the life of a Jewish salesman in Dublin by means of the "stream of consciousness" device so widely imitated by others. Unrelated wisps of thought, as they float through the consciousness, are set down without apparent pattern.

Among the new talents developed in the 20th century D. H. Lawrence stood out as an explorer of the darker reaches of the soul. He infused a gnawing vitality into the strange, obsessed novels he wrought out of his sick, unhappy life. Katherine Mansfield was a genius, cut short by death, who in such fragments as "Bliss" showed powers akin to the great Russians. Popularity came to Sir Hugh Walpole for his story telling instinct, easy style, and for his faithful portraiture of certain easily-recognizable types of character.

The average reader was puzzled by the novels of Virginia Woolf, cloudy flights in psychology at once vivid and vague. There is as much subtlety and delicate feeling with far more clearness in Frank Swinnerton's "Nocturne" or Anne Douglas Sedgwick's "The Little French Girl." A fine study of Anglo-Indian relations appeared in E. M. Forster's "A Passage to India," a novel created slowly and thoughtfully by a mind unvitiated by too great facility.



GEORGE BERNARD SHAW

Bernard Shaw's plays with their satiric comment on life and character, have won him a world wide reputation. In the prefaces to his printed plays and in his books on current affairs he has applied the Socialist political philosophy in a provocative manner.

Ultra-modern was Aldous Huxley, who satirized fashionable London life in "Point Counterpoint." Michael Arlen had a meteoric success with a series of clever sketches in the same vein.

Though he achieved fame by his plays, it is probably for his novels that W. Somerset Maugham will be remembered. "Of Human Bondage" is all too much like life in its weight and drag and lack of conclusiveness. Novelists who choose the World War as a theme include Richard Aldington and R. H. Mottram.

When realism and psychological analysis bear down upon the reading public too hard, it is on such delightful stories as "The Constant Nymph," by Margaret Kennedy,

that sudden popularity descends. She is one of a large group of recent literary successes which includes Rebecca West, Compton Mackenzie, Sylvia Thompson, Clemence Dane, Francis Brett Young, Rose Macaulay, Rosamond Lehmann, Sheila Kaye Smith, David Garnett, Ethel Mannin, E. M. Delafield, A. J. Cronin, James Hilton, and others. J. B. Priestley, author of "The Good Companions," has attained wide popularity with both novels and plays.

Poetry of the period developed a somewhat bewildering interest in all sorts of startling experiments in new forms, and while such poets as A. E. Housman and John Masefield (made poet laureate in 1930) clung to the old forms, their subject-matter and points of view were essentially new. Housman's "A Shropshire Lad" echoes long in the mind and Masefield's "The Everlasting Mercy" and "The Widow in the By Street" shocked the conservative by the beauty they lent to sordid themes.



JOHN MASEFIELD

John Masefield became Poet Laureate in 1930. He is best known for his long narrative poems dealing with English country life which make romance out of sordid conditions and for his novels original in construction and in subject-matter.

T S Eliot led the modern symbolist school, his "The Waste Land" aroused a storm of controversy over its startling form and obscure content, but later as a dramatist he was more widely appreciated. To his school, too, belonged the poet W H Auden. Richard Aldington, with "Images Old and New," was an "imagist."

The war note was, of course, to be heard in much poetry of the 20th century. Rupert Brooke and Wilfred Owen were young poets who lost their lives in the waste of war. Siegfried Sassoon, Robert Graves, and Robert Nichols survived to condemn war in verses of bitter realism.

Robert Bridges, poet laureate, 1913-1930, showed extraordinary technical power in creating subtle rhythms and in depicting Nature. James Stephens played new tunes on old Irish tales, and Padraic Colum and W B Yeats likewise developed Irish themes. Sir William Watson was a poet in the great tradition, a master of true eloquence.

A number of novelists and essayists also occasionally turned out excellent verse, including G K Chesterton, Hilaire Belloc, Walter de la Mare, and Alice Meynell.

Chesterton and Belloc led in the field of the witty, provocative, controversial essay, and Max Beerbohm in the gently malicious parody, essay, and caricature.

In the varied field of non-fiction writing, no piece of work in English was more remarkable than "Travels in Arabia Deserta" by Charles M Doughty, which, though written in 1888,

took on a new lease of life after the publication of "Revolt in the Desert" by Col T E Lawrence. The latter abridged work later appeared in full as "The Seven Pillars of Wisdom." Lawrence, as a writer of prose of great merit, also published an extremely interesting translation of Homer's Odyssey. Lytton Strachey infused new life into the art of biography with his "Queen Victoria." His aim was to "remove the whitewash" from historical characters and portray them dispassionately and without bias. Philip Guedalla and a host of others followed him in this field.

#### Modern Essayists and Critics

Brilliant essays and criticism, as well as fiction, came from the pens of John Cowper Powys and his brother, Llewelyn Powys. Literary critics of distinction were George Saintsbury, W P Ker and Sir Edmund Gosse. The work of the learned George Santayana, born in Spain, who lived for many years in the United States before taking up residence in England, may properly be classified as belonging to English literature, which is enriched by his beautifully written critical studies.

English writers of today show less tendency to experiment with new forms than do those of other countries, but much fine and enjoyable work is being done. The age is too close to us to determine whether any modern writer is truly great, or to know what names will be the most outstanding. (See also Drama, Essay, Novel, Poetry)

## EXPLAINING *the* ENGRAVER'S ART

*If it were not for the art of engraving few of us would ever see the beauties of the works of the old masters, for it is in engraved copies that they are usually reproduced*

**Engraving.** Some time before printing from movable types was invented, men learned to print from crude wood cuts such productions as playing cards and short religious tracts and booklets. Most people could not read in those days, so the tracts at times consisted almost entirely of pictures, with a few words of text at the foot.



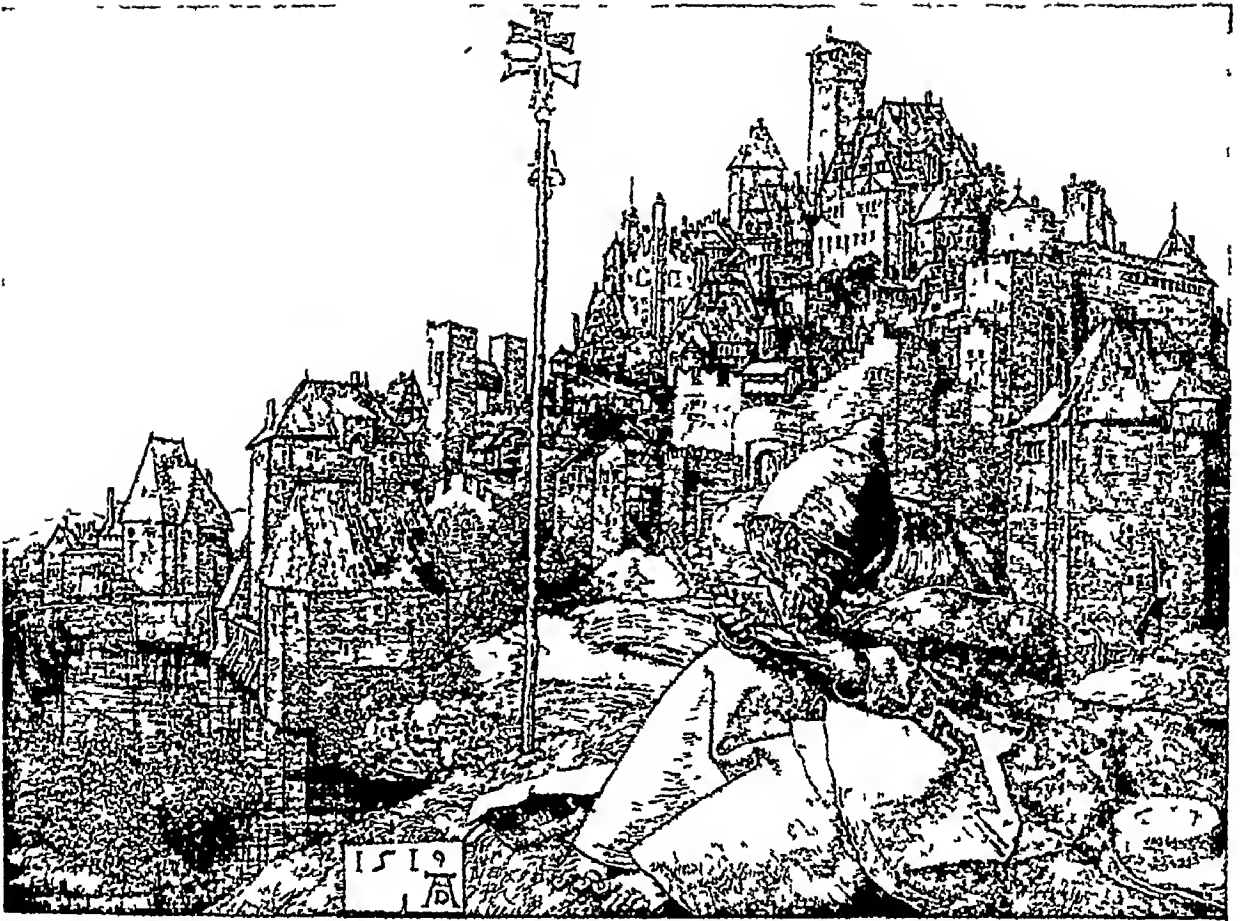
Woodcut c. 1530

At first these pictures were very crude, and many of them are so quaint that they make us smile. It was not long, however, before engravings became things of beauty, and not mere diagrams to illustrate a point. Many of these old illustrations are prized possessions

now, for museums, libraries, and also many private persons make collections of them, and quite large sums are often paid for a single print.

There are three ways in which designs can be printed on paper. First, there is relief printing, in which the design to be printed stands up in relief, as type does on a typewriter or on a rubber stamp. The second method is from a lowered surface, the ink being pulled from lines or depressions cut in a metal plate on to moist paper or cardboard, as in printing copper plate visiting cards. The third method is printing from a flat surface, without perceptible relief or depressions, as in lithography. In all of these processes, of course, the lettering or design must be reversed in the engraving, as otherwise when printed it would resemble reading matter seen reflected in a looking-glass.

Until late in the 19th century engraving was mostly handwork. Wood engraving was the earliest means by which illustrations were



## NUREMBERG ENGRAVED BY DURER WITH MATCHLESS SKILL

As a painter, Albrecht Durer was not a supreme genius, but as an engraver on wood and copper he has never been surpassed, and it is to the superb engravings on wood and copper he produced at Nuremberg in the last few years of the 15th and the early years of the 16th century that he owes his enduring fame. The illustration shows a characteristic engraving, as perfect in composition as it is in line. It is entitled "St. Anthony," and the picturesque city in the background is Nuremberg.

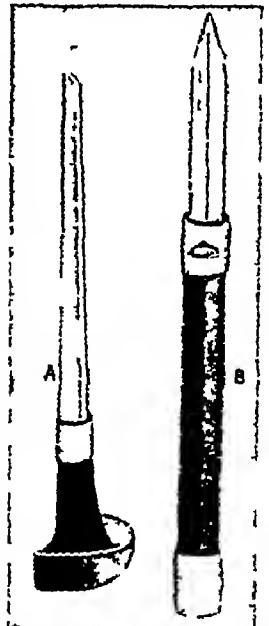
made. In this method the artist first draws the design on a boxwood block, and then carefully cuts away between the lines with a chisel-like "graver," until the whole pattern stands high in relief, so that when it is inked the design can be printed.

The Chinese have been stamping pictures on paper and silk with wood-blocks for many centuries, and incised blocks of wood have been found in some of the ancient tombs of Thebes. The Assyrians, it is believed, stamped designs on bricks with similar blocks, and the scribes of the early Christian era often used stamps for the ornamental capital letters in their MSS.

Wood engraving was the method used for illustrations in the first printed books, and it remained in common use until about 1880. Wood engraving had one great advantage over other old forms of engraving, for blocks so engraved could be printed on an ordinary printing press along with the type, while other old engravings had to be printed separately. In recent years, too, it has undergone a tremendous revival as a pure art, and many superb examples are produced. It is again coming into favour for book illustration, more

especially for works on natural history.

"Line engraving" is the name of the process which prints from depressions cut in the surface. For a long time it held first rank in the engraver's art, and was used by the great artist engravers, Albrecht Durer, Rubens, Van Dyck, and others. In this method lines and depressions are cut on copper or steel plates, the burin or graver, a diamond-shaped chisel, being pushed away from the artist, and the slight roughness or "burr" later removed with a scraper. Thus, the essential of this method is a very clean line. The plate is inked over—this fills in the depressions—and the remainder of the



**FOR ENGRAVING**  
These are engraving tools. A, a graver, or burin, with which the lines are cut, B, the scraper, with which the burr is removed.



## ENGRAVING

surface of the plate is then wiped clean. When the plate is pressed against a sheet of moistened paper, the ink is transferred to the paper.

That it is possible to print from such a plate was discovered quite by accident by an Italian goldsmith who was decorating gold- and silver-ware by filling engraved lines with enamel and allowing it to harden. To obtain the effect he desired, it was his custom to rub soot and oil into the incisions before permanently filling them with the enamel. One of these plates was accidentally laid face downwards, and when it was taken up there was the design printed on the white surface on which it had rested.

Artists quickly seized on this idea, and for nearly four centuries line engraving ranked as one of the highest arts, but it is now largely used as an accessory to etching or dry-point.



**ETCHING MADE BY REMBRANDT**

Etchings are made either by drawing direct on to a copper plate, or by biting out with acid a drawing made on a wax coating laid on the metal. The illustration shows an etching by Rembrandt. It is a self-portrait, and only four first impressions now exist.

Dry-point is a somewhat similar method in theory, but it produces very different results. Here the plate is of zinc or copper, and the graver, a very hard steel point, is drawn towards the artist, throwing out a rich burr upon one or both sides of the groove. This burr is left on the plate and holds the ink during printing, thus giving the dry point peculiarly warm, soft lines, very different from the sharp outlines of the engraving. From Dürer on-

wards all great engravers have used dry point at times, frequently to add finishing touches to etchings.

Etching is a much more complicated process, which will always remain popular. The entire copper plate is first coated with a "ground," a mixture of beeswax and other substances which have been heated until they are liquid. After this has hardened, the design is drawn on the wax with an etching needle, scratching lightly through to the copper. A strong biting acid is then poured on, which eats into the copper wherever the metal has been exposed without affecting those portions protected by the "ground." After the lines have been eaten out to the proper depth, the plate is cleaned and it is ready to be printed in the same manner as a line engraving.

The line engraver gives more accurate details, but the etcher has more freedom of line and shading, often the two are combined, the line work being done on the plate after it has been "bitten", or dry point is used to complete the etching with softer tones.

Etching was probably invented early in the 15th century, and many of the greatest artists have practised this process. Van Dyck and Rembrandt were especially interested in it, the latter being probably the most important figure in the whole history of this art. Later many leading artists tried their hand at it, but its great revival in the 19th century was due to Sir F. Seymour Haden and J. A. M. Whistler. Great modern etchers include Frank Brangwyn, Sir Murrhead Bone, Alphonse Legros and Anders Zorn.

### The Mezzotint

The "mezzotint" is a process essentially applied to the reproduction of paintings. It was carried to great perfection a little more than a century ago. Here the plate is first roughened all over with a tool called a "rocker" until it is completely covered with minute, uniform, and regular holes. These hold ink, as do the lines of a line engraving, and also have a characteristic burr. If the plate were now inked and printed the result would be a mass of deepest

black, but the artist scrapes away more or less of the roughened surface, as the parts require to be light or dark. Those portions scraped the deepest take the least ink, while the parts left untouched produce the deepest shadows. The English have long been pre-eminent as mezzotinters, and for mezzotint works after portrait painters of the great English school high prices are paid. To Sir Frank Short, R.A., we owe a great revival in this type of engraving.



## ENGRAVING

In "stipple engraving" dots and holes etched into the plate make up the design. This style was often used in combination with the other processes for reproduction of flesh tints, and was brought to perfection by Bartolozzi and other mezzotinters. In effect it imitates crayon work, and it had great popularity in colour reproductions. "Steel engravings" are usually produced by etching, but the graver is also used. The chief advantage lies in the large number of prints that can be made.

Surface printing began in the latter part of the 18th century when "lithography" was invented. In this process the design is drawn in greasy ink on polished slabs of limestone of fine texture, and the surface is then wetted. The water remains only on the parts not protected by the greasy ink. If a roller covered with printing ink is then passed over the stone, the ink sticks to the greased portions, while the parts wet with water repel the ink and remain clean. All that is needed is to press a piece of damp paper down on the stone, and it will receive an impression in ink of the design drawn on the stone. Various methods are used for transferring designs to the stone, such as drawing with a pen or brush, printing or drawing on specially treated paper, or photography.

Lithography was invented by a German named Senefelder in 1796. As an art it reached its height in France during the reign of Louis Philippe (1830—1848). Many painter lithographers used it as a means of artistic expression,



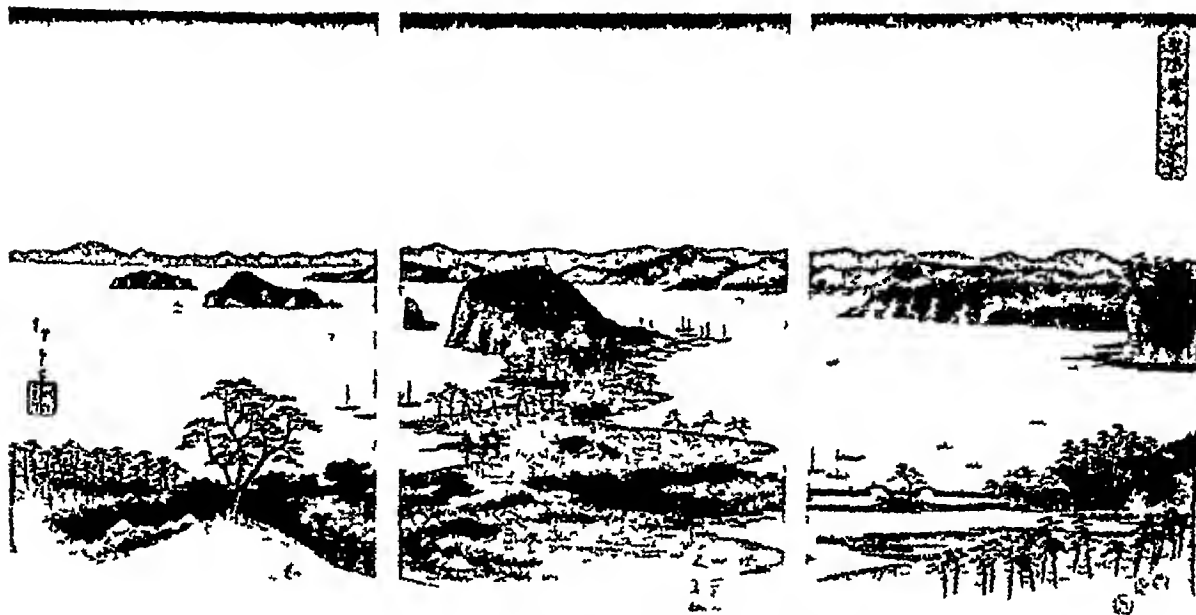
### THE COPPER AND THE PRINT

In making an engraving the line is obtained by direct pressure of the tool on the metal. On the left is a stippled engraving on copper of a sketch by G. Morland and on the right is an impression from the plate.

finding that it permitted greater freedom than steel, copper, or wood engraving, because it made possible an infinite variety of tones. It is still the principal process used for posters.

About the time that lithography was at its height, however, photography was invented, and a new day for illustrators dawned. The various types of process for the reproduction of photographs are evolved to a greater or lesser extent from engraving, and are described under the heading Process Engraving.

The simplest of all engraving processes, one which you perhaps practise at school, is the linocut. In this the general process is the same as the woodcut, plain thick floor linoleum is the best material to use, though special qualities for cutting can be obtained. A linocut gives a fine effect for broad work, is quick and easy to do, and can be printed in colours, one block being made for each colour. At



### A LOVELY EXAMPLE OF JAPANESE COLOUR ENGRAVING

Perhaps the most beautiful of the various kinds of picture that can be produced by engraving is the "colour print." This is made by printing a series of wood-blocks one over the other. Each block carries a different coloured ink, and thus overprinting can create delicate effects unobtainable by any other means. During the 18th and 19th centuries colour printing was developed to a remarkable degree by Japanese craftsmen. Reproduced above is a splendid example of the work of their great master Hiroshige, it is called "Full Moon on Kanazawa" and is now in the British Museum.

the same time, quite fine work can be done with care, and the best linocuts compare favourably with rougher woodcuts. In Central Europe this art has especially proved popular, and it has produced many notable artists of a distinct school.

Another form of engraving which is used very extensively, but almost solely, for commercial art is "scraper-board." This is done on a specially prepared board, usually a sheet of thin card, which has been covered with a uniform layer of china-clay (kaolin). The whole area to be used is first blacked over with printing ink of some sort or another, and the design is scraped out on it. The great advantage of scraper-board is that the finished article is used direct for photographing for reproduction, and no prints are made from it. On the other hand, each design can be used only once, which makes the process expensive. Scraper-board gives a clear and direct contrast between black and white. "Tinted" scraper-board has a matt surface of raised dots, enabling a gradation of tones to be obtained by removing the dots as in the mezzotint process.

**Entomology.** You may find yourself confusing this science with etymology, but whereas that deals with words, this tells us all about insects. The word is derived from Greek *entomon*, "cut up" (in allusion to their structure), which is just what the word "insect" means in its derivation from Latin. Expert entomologists tell us that the insects, the study of which occupies all their time, are our chief enemies in the modern world, so that this is really a very important science. And when you hear, on the authority of figures which cannot be denied, that a single species of insect may cost a country hundreds of thousands of pounds in damage every year, you will agree that entomology is worth studying. The men who work to keep insects at bay are called "economic" entomologists, others, of course, do different types of work, such as the men in museums whose business it is to classify and identify all types of insects.

From a practical point of view, entomology concerns everyone who grows any kind of plant, from the small gardener whose roses are

attacked with "green-fly" to the fruit-grower whose thousands of acres of oranges or apples are beset with their particular pests. Then there is a special branch of the science known as "stored products" entomology, which deals with the insects that live on things in warehouses. There is practically nothing in the way of soft goods and foodstuffs, from leather and tobacco to dried ginger and flour, which is not attacked by some insect, and occasionally great warehouses are literally crawling with caterpillars and beetles. Many firms have special staffs of men who are spending their whole time

on these problems, and every government spends thousands of pounds a year on them, too.

So you see that when you start your collection of butterflies and moths you are sharing in one of the most important of modern sciences, and one on which, some people say, the future of world economics largely depends.

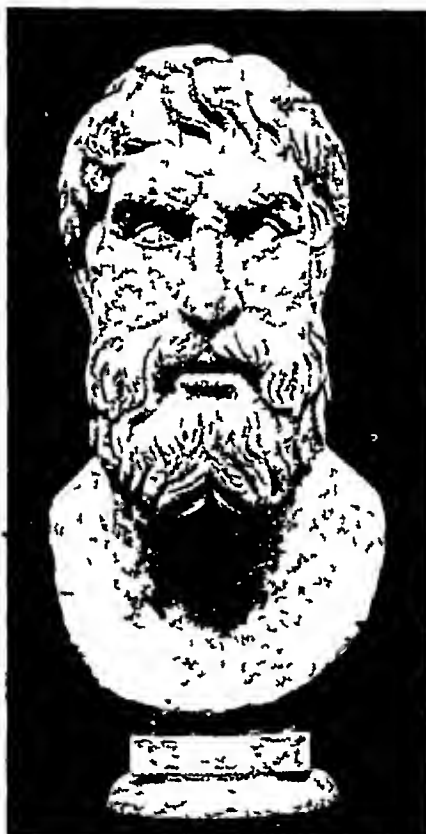
**Epictetus.** Man must find happiness within himself, this Greek Stoic philosopher taught, and not in his surroundings. "No one is a slave whose will is free," he declared.

The name Epictetus is the Greek for "acquired," and denotes his servile condition. His real name is unknown. He was born in Phrygia about A.D. 60, and in Rome became acquainted with the Stoic philosophy, which taught that virtue was the highest good, irrespective of pleasure or pain. After he gained his freedom Epictetus began to give lessons.

About A.D. 90 the Emperor Domitian banished all philosophers from Italy, and Epictetus went to Nicopolis, in Epirus,

where he opened a school. He continued to teach the doctrines of Stoicism until the time of his death. He wrote nothing, but talked in a familiar way with his pupils concerning the conduct of life. Arrian, the historian, his favourite pupil, took down much of his teaching, which is preserved in two treatises—the "Discourses" and the "Enchiridion" (Handbook).

**Epicurus.** (341–270 B.C.) "Let us eat, drink, and be merry, for tomorrow we die." This is the phrase commonly used to sum up the philosophy of Epicurus, but it gives a very extreme and mistaken view of his ideas, and the fact that in modern language the word Epicureanism is so often used to indicate



EPICURUS

This great Greek's philosophy of pleasure has often been misunderstood. His own life was simple—he was a good friend and loyal citizen.

Ny Carlsberg Museum Copenhagen

addiction to sensual pleasures, and particularly to indulgence in eating and drinking, still further shows the common misunderstanding of his principles. Epicurus certainly taught that pleasure is the aim of life, the only happiness, but what he meant by pleasure was something quite different from modern notions. According to Epicurus, pleasure was the absence of pain and worry, it was a habit of mind, not the excitement or exuberance of a moment. No pleasure, he said, is bad in itself, but only this special kind of pleasure is a true good. Understood aright, the desire for pure pleasure leads to a desire for righteousness and virtue, the virtuous man alone is happy.

The founder of the school of philosophy known as Epicureanism came of Athenian parentage and was born in Samos. He taught in various places in Greece, and, settling in Athens in 306 B.C., founded a school in his garden, where he and his followers lived a life of the greatest simplicity. Among his chief disciples was the Roman poet Lucretius, whose great poem "De Rerum Natura" (On the Nature of Things) embodies the main teachings of Epicurus.

**Epstein, JACOB** (born 1880). Very possibly you may think the works of this modern sculptor are strange, and even difficult to understand, yet you cannot help being struck by them, one way or another. In London itself you will see some of his most famous works, such as the relief of "Roma" on the memorial to W. H. Hudson in Hyde Park (see Hudson, W. H.) and the famous "Night" and "Day" on the Underground Building at St. James' Park Station. But these are large works, and do not show Epstein at his best, for there is no doubt that he is more of a modeller than a sculptor. For that reason you yourself, as well as the art critics, will probably approve more fully of some of his magnificent portrait busts, an example of which is seen above.

Jacob Epstein was born in New York, of Russo-Polish parents, and he studied widely before settling in London, which has always remained his artistic headquarters. As early as 1908 he was commissioned to execute large works on important buildings, and he has been active, therefore, for nearly thirty years. Although now he can scarcely be considered "modern," he still repeatedly produces works which rouse critics and public alike to a frenzy of abuse or enthusiasm, although no longer to such a pitch as was reached on the appearance of his "Christ" (1920), and "Genesis," (1931).



JACOB EPSTEIN AND ONE OF HIS BUSTS

No artistic works of recent years have caused such great differences of opinion or provoked such bitter discussion as the sculptures of Jacob Epstein. He is here seen with a bust, "Roma II," a characteristic example of his work.

**Equinox AND SOLSTICE** Twice a year—once about March 21 (called the vernal equinox) and again about September 22 (called the autumnal equinox)—the sun is in the plane of the earth's equator. The name (from Latin *aequus*, "equal," and *nox*, "night") is derived from the fact that the length of the night then exactly equals the length of the day, since the rays of light from the sun on these dates fall upon the earth perpendicular to the axis of the earth.

At the vernal equinox the earth has completed one-quarter of its revolution about the sun, and at the autumnal equinox three quarters. Because the sun then appears to be on the equator, the equinoxes are popularly spoken of as the dates on which "the sun crosses the Line." "Equinoctial storms" are commonly supposed to accompany the event.

The solstices ("standing still of the sun") come at the other quarters of the earth's revolution—the summer solstice (about June 21) when the earth is at its farthest point from the sun, and the winter solstice (about December 22) when the earth is at its nearest point to the sun. The days are longest at the summer solstice and shortest at the winter solstice in the Northern Hemisphere, in the Southern Hemisphere they are reversed.

"Precession of the equinoxes" is the term applied to the slow advance from east to west of the equinoctial points, or the points at which



ERASMUS GIVING GOOD COUNSEL TO CHARLES V

In this picture we see Erasmus at Brussels, giving advice to the Spanish boy-king (afterwards the Holy Roman Emperor Charles V), who is seated beside his mother. For a short time Erasmus was Charles's tutor, and he eked out a slender income by teaching the young sons of many great men. His real work, however, was as a stimulator of interest in the language and literature of the ancient classical civilizations, and he ranks amongst the greatest scholars of his age.

the equator and the ecliptic intersect each other. The change is so slow that it takes about 25,800 years to make a complete shift around the ecliptic. (See Earth, Sun)

**Erasmus, DESIDERIUS** (1466?-1536) The life of Erasmus was the death of the Middle Ages. With his pen he purged the Church of its abuses and outworn traditions, he returned to the Bible itself and to the early Fathers for his conception of Christianity, and this meant the end of medieval stagnation in theology and humanism. He has been much criticized for the part he played in the Reformation and for his attitude towards Luther. "Erasmus laid the egg, and Luther hatched it," it was said. The truth is that Erasmus was a man of letters, not a theologian, he was not the stuff of which religious zealots or martyrs are made. To use his own words, "I am afraid if I were put to the trial, I should imitate St. Peter." While conscious of the faults of Roman Catholicism he always remained a Catholic, and while acknowledging the need of religious reform, he clearly saw the dangers that would inevitably follow extremist efforts in that direction. As R. B. Drummond, one of his biographers, puts it, "Erasmus was in his own age the apostle of common sense and of rational religion. From the beginning to the end of his career he

remained true to the purpose of his life, which was to fight the battle of sound learning and plain common sense against the powers of ignorance and superstition, and amid all the convulsions of that period he never once lost his mental balance."

A fascinating picture of his parents and of himself as a child is given in Charles Reade's novel "The Cloister and the Hearth." He was born either at Rotterdam or at Gouda on October 28, probably in 1466, a son of Gerard de Praet of Gouda. For the name Gerard (meaning "well beloved") he substituted the incorrect Latin and Greek equivalents, Desiderius Erasmus. Young Erasmus became a priest in 1492. After several minor posts, and a course of study in Paris (in 1496), he was persuaded to visit England.

He resided chiefly at Oxford, and became the friend of Sir Thomas More and Colet. In 1500 he returned to Paris, resolved to devote his life to study. He revisited England in 1506 and 1509, and was appointed professor of Greek at Cambridge and Lady Margaret professor of Divinity. At Cambridge he wrote the famous satire on clerical abuses and human follies called "Moriae Encomium" (Praise of Folly), and completed his work on the New Testament. For some time afterwards he led a wandering life. Finally, in 1521 he settled at Basle,

and from 1529 to 1535 lived at Freiburg, whence he returned to Basle, where he died, July 12, 1536.

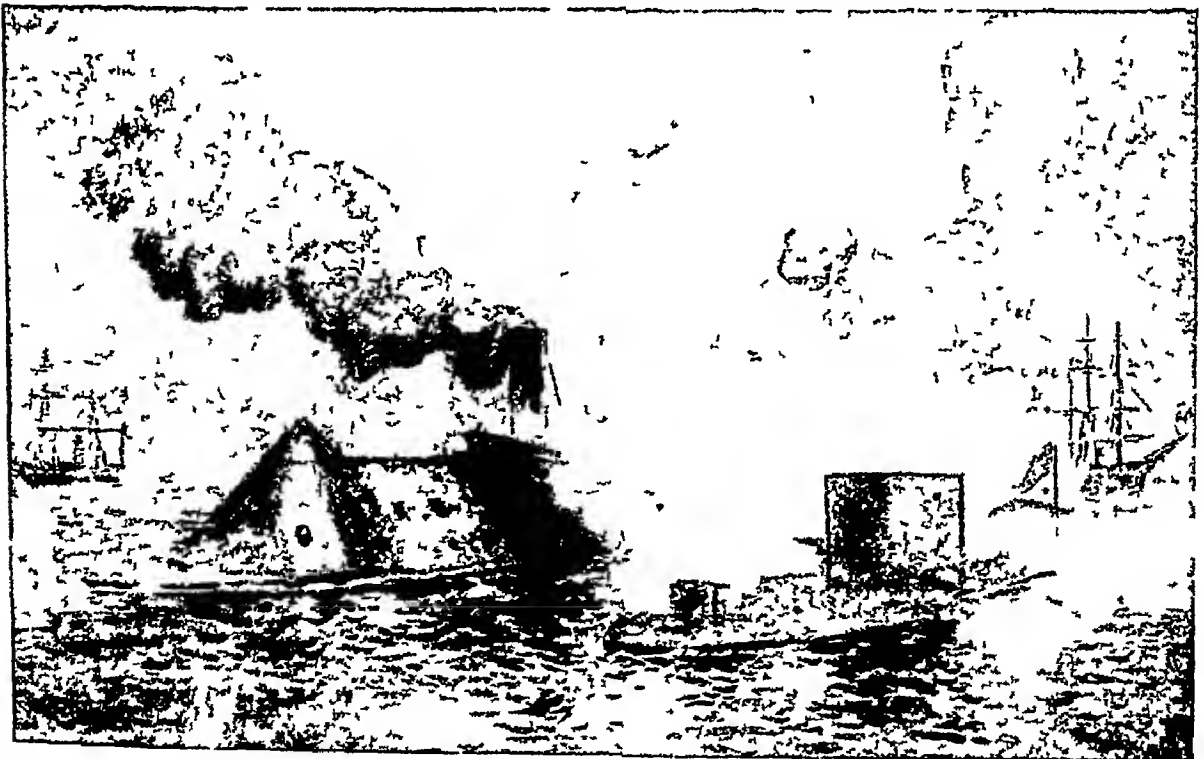
Erasmus was the greatest humanist of the Renaissance and one of the most industrious scholars that ever lived. Of his editions of classical works the most important is Terence (1532). His reputation was established by his "*Chilades Adagiorum*" (Thousands of Adages), published in 1508, a collection of over three thousand Greek and Latin proverbs relieved by apt comments and lively anecdotes. He edited many of the Fathers of the Church, but his greatest service to theology was his edition of the New Testament (1516), a Greek text with a Latin translation, his superb treatment of which entitles him to be called the pioneer of Biblical criticism. The "*Enchiridion Militis Christiani*" (Dagger or Manual of the Christian Soldier), 1502, is an attack on formal religion, and the "*Colloquia*" (Conversations), 1516, is a series of dialogues on topical subjects, and especially a castigation of the vices of priests and others of the period.

**Ericsson, JOHN** (1803-89) This Swedish American engineer was born in Vermland, Sweden, July 31, 1803. He showed a mechanical bent very early, and from 1820 to 1827 he was in the Swedish army. Coming to England, he built, with John Braithwaite, a locomotive

engine which was beaten by Stephenson's "Rocket" in the Liverpool and Manchester railway competition of 1829. Ericsson was occupied with various inventions, chiefly marine engines, up to 1836, when he brought out a marine screw propeller. In 1838 he designed the engines and propeller used by the first vessels to cross the Atlantic in regular steamship service.

In 1839 he went to America, becoming a naturalized American in 1848. Turning his attention to defensive armour for warships and improvements in marine engines, he designed in 1861 the first armoured turret ship, the Monitor, which became famous for her action with the Confederate vessel Merrimac. Ericsson died in New York, March 8, 1889, and the following year, at the request of the Swedish government, his body was sent to Sweden, where it was buried.

**Eritrea.** An Italian colony since 1889, Eritrea now forms part of the Italian East African Empire, Italian sovereignty being recognized by the Anglo Italian Pact of 1938. Before the conquest in 1936 of Abyssinia, Eritrea had an area of 45,750 sq miles and a population of 600,000. The chief town is Asmara (population, 56,000), and the chief seaport Massawa (pop 15,000), on the Red Sea. There are two zones, the tropical lowlands along the coast and the cooler uplands, both suitable for agriculture.



#### ERICSSON'S ARMOURD TURRET SHIP GOES INTO ACTION

The first naval action fought by ironclad ships was that between the Merrimac and the Monitor in Hampton Roads on March 9, 1862, during the American Civil War. On the previous day the Merrimac, an old ship cut down, with an iron superstructure erected on the hulk, had done great damage to the Federal fleet. On March 9 however, the tables were turned, for the Confederates Merrimac was met by the Monitor, a Federal ironclad designed by John Ericsson. She was a small ironclad ship with one revolving turret. The Merrimac had the worst of the four hours encounter.





M. H. Crawford

### GROWER OF 'ROYAL ERMINE'

The stoat produces one of our most highly prized furs. It is his white "winter coat" that fashion fancies. A lot of these little animals must die to make one judge's robe, for they are only ten inches long, with a four-inch tail. In Edward III's reign "royal ermine" could be worn only by members of the royal family.

**Ermine.** A quick, restless, brave, and bloodthirsty little animal is this member of the weasel family, *Mustela erminea*, better known in Britain as the stoat. It has a slender body, about

and queens and it is still used for the robes of judges in England. The pure white colour of the fur has made it the symbol of the purity which should attach to the office of judge

ten inches long, and short legs. It runs swiftly, climbs and swims well, and feeds on smaller animals and birds, being a great enemy of rats and rabbits. It is found in Europe as far south as the Alps, and in Asia and North America.

In summer the fur is red-brown above and yellowish white underneath. In the northern part of the stoat's range the fur in winter changes to a beautiful white, all except the tail, which has a black tip. This fur is the ermine formerly used in the linings of the robes of kings

## With the ESKIMOS in the ARCTIC

*In the far north of America and a part of Asia, in a land of ice and snow, lives the race of exceedingly interesting people known as the Eskimos. In this article we are privileged to pay them a visit.*

**Eskimo.** When explorers first reached the Arctic lands, they found the Eskimos living much as some of them do today. Then, as now, they were scattered all along Labrador and the north coast of America, on the Arctic islands, on Greenland, and on a part of the Siberian coast. They are closely allied to the natives of the Aleutian Islands, off the Alaskan coast, and many scientists believe that they are of the same stock as the American Indians, whom they resemble in their straight black hair, obliquely set eyes, and brown skin. A tribe of blonde Eskimos, however, was discovered by Stefansson during his 1910-11 expedition on Coronation Bluff, far in the Arctic Zone.

Although they are so widely scattered, all Eskimos are extraordinarily alike in language, habits, and appearance. Some tribes, in districts farthest

south, have adopted many civilized ways from the white people. They learn readily and show marked intelligence. They are cheerful and merry, fond of music, and make excellent mimics. Generosity, hospitality, and friendliness to strangers are characteristic traits. Warfare is almost unknown among them.



Dorsten Leigh

### ESKIMO 'KIDDIES'

Nearly all Eskimo children are plump and smiling. They have enormous appetites, and these three could polish off a seal in no time. They have to eat plenty to keep warm in their icy surroundings.

Although the Eskimos cover such an expanse of territory, they probably do not number over 40,000. Their villages are small, with from 25 to 200 inhabitants. There is no chief and no form of government. Each tribe has its own territory. Sometimes all the people of a village will be found living in a community igloo—dome shaped huts made of snow with only one opening in the roof—where all share alike. Most of the Eskimos of West Greenland, Labrador, and Southern Alaska have



## ESKIMO

accepted Christianity. The name "Eskimo" was given them by their Indian neighbours, and means "eaters of raw flesh." Their own name for themselves is "Innu't"—"men" or "people."

Not all Eskimo tribes are uncivilized, for in the south west of Greenland, for instance, they have been in contact with Europeans for nine

centuries, the Norsemen having colonized part of that area at about the time of the Norman invasion of England. Indeed, the Eskimos have a literature and art of their own, the best examples of which they have been publishing in an annual, printed by themselves, for the last eighty years or so.

## *A Day's Visit in Eskimo Land*

**T**ODAY you shall be the guest of Kessuh, the Eskimo boy, whose home is in the Great White North. Of course you have heard of this strange, brown-skinned race—who live so much of the year without sunlight, who drive dogs instead of horses, never eat bread and-butter, and whose men and women dress exactly alike. Now you are to meet them.

Kessuh has brought you a suit of furs, such as all Eskimos wear, for your sweater and overcoat will never keep out the biting cold of a Greenland winter. The shirt is made of the

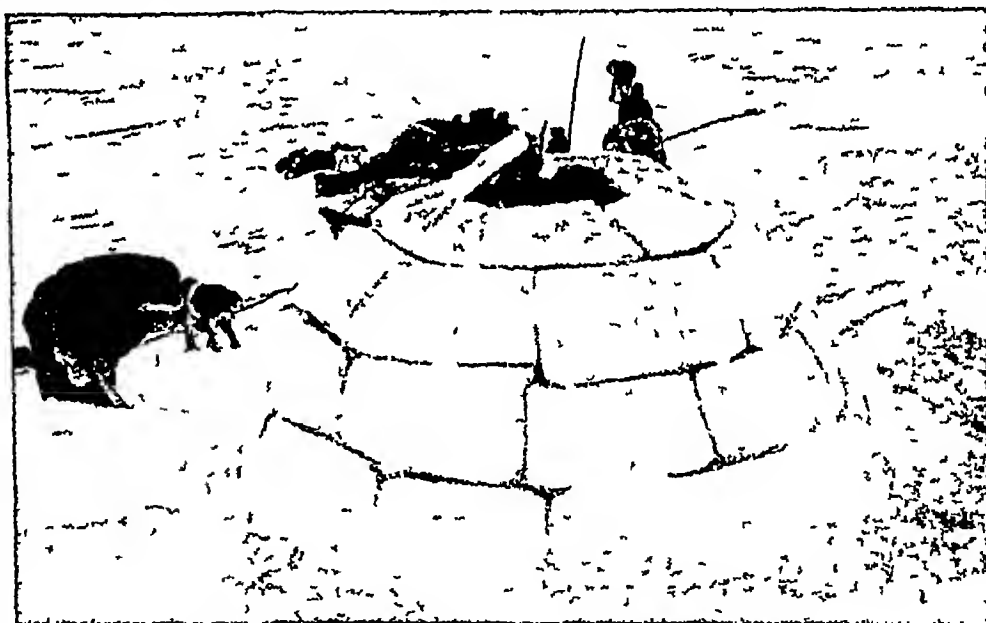
breasts of eider ducks. There are two pairs of trousers—one of seal skin made with the fur side in, and an outer pair of reindeer skin with the fur side out. The jacket is of bear-skin, with a hood that fits close about your face. When, with all this, you have put on the high seal boots and fox mittens, you feel very much of a zoo!

Now you are off for the village. The long winter darkness has begun, and although by your watch it is mid morning, you travel by starlight, for the sun has disappeared for six months from the Arctic regions. In the dim twilight you look in vain for streets. You see only a few scattered snow-covered mounds.

Kessuh stops before one of the mounds and motions you to follow. On your hands and knees you creep through a stuffy tunnel. This is the hallway to Kessuh's house, or "igloo." You find that it has only one low smoky room half under ground, a sort of cave walled up with

rocks, and the chinks filled with moss and earth. Sometimes when on a journey the Eskimos build their conical-shaped igloos of rectangular blocks cut rapidly from the snow or ice.

The room is lighted by a strange lamp, a rude kind of basin shaped from soapstone and filled with whale or seal fat. The burning wicks of twisted moss give out heat as well as light, and over this lamp stove Kessuh's mother is boiling his dinner. But Kessuh does not care much for cooked meat; he is just as happy with a piece of raw frozen fish or bear flesh.



THE ESKIMO'S HOME OF SNOW BRICKS

In the Arctic regions, where the winters are long and the temperature is often many degrees below zero, much care must be taken to build a home that is warm and proof against blizzards. The Eskimos of the mainland and islands of Northern Canada build what are known as "igloos"—dome-shaped huts made of blocks of frozen snow, with an opening in the roof. Despite the material of which they are made, these huts afford a comfortable and cosy home for their occupants.

Photo Vilhjalmur Stefansson

Kessuh's sister is sewing bird skins together to make a shirt. Her bone needle looks clumsy, and she uses sinew for thread, but she makes a very neat seam.

The father is making a bow from the rib bone of a whale. He is stringing it with a thong of fox-hide. Now he lays it aside to eat a great piece of raw flesh which the mother has cut from a half-skinned seal that lies on the earth floor. He is a short stocky man, about 5 feet 4 inches high. In his furry clothes he looks like a bear.

## ESKIMO

On one side of the room is a low platform made of bones. You follow Kessuh to the platform, and there among the furs that cover it is an Eskimo baby, with only its head sticking out of a bag of feathers. Kessuh lifts it up and rubs his nose against its little flat nose. The sister leaves her sewing and comes to rub noses with baby, too. This is the Eskimo way of kissing.

The mother, seeing the baby awake, brings a handful of seal blubber. She feeds the baby a bit, and he crows and reaches for more. Kessuh and his sister look longingly at the greasy tit-bits. Their mother gives them each a piece, and they smack their lips over it. She offers you one, and when you say, "No, thank you," Kessuh looks surprised. He thinks it very strange that you do not like their food.

The mother takes the baby up and puts it into a long fur hood at the back of her coat.

You are glad to leave the close, ill-smelling room. You find the wild wolfish dogs lying in the tunnel hall. They follow Kessuh, crowding and yelping about him, as he goes to the cache, a snow cave, and takes out pieces of frozen walrus meat for them. The moon is now shining, and you watch Kessuh and his sister dig the sledge out of the snow that has hidden it. You examine the low runners and cross-pieces, so skilfully made of bone. It is very light, but it is also very strong, as you find when, wrapped in a fur robe, you go for a swift ride over the white fields. Kessuh sits in front and guides his six dogs with a long leather whip.

If you could understand Kessuh's language he would tell you many thrilling tales as you glide along. He would speak of the bright summer, when for whole months together the sun does not set on his Arctic home, and the



**WELCOME FOOD AND FUEL FOR THE ESKIMOS**

The Eskimos of the Arctic circle are great hunters of seals and skilful wielders of the harpoon. This photograph shows a scene on the shore just after a seal has been harpooned. The carcass has been towed ashore and the boat beached, and now comes the arduous task of dragging the carcass to the place at which it is to be cut up. A big seal may be as much as nine feet in length. Seals provide not only food for the Eskimos, but clothing and oil.

*Photo Vilhjalmur Stefansson*

Here it rides contentedly as she goes about her work. She is shaking and rubbing some wet skins that hang on a drying-rack made of bones. On this same rack are sets of strong reindeer-hide straps. These, you think, must be the dog harness. You remember that it has to be kept out of reach or the dogs would eat it.

The father has finished his seal meat and lies down on the platform-bed. The mother comes to him with hands full of small pieces of flesh and blubber. As he lies on his back she feeds him until you wonder how he can possibly swallow more, but he is still eating greedily when Kessuh takes up the harness and beckons you to come.

ice breaks up in the bays and inlets. Then come the exciting times when the caches are filled with game for winter food. This Arctic summer is one long hunting party. The Eskimos leave the unwholesome igloo and live in "tupeks," or tents of skin, which they can carry about with them.

Kessuh could tell you where the eider duck fills her down-lined nest with eggs, where the great white owl makes his home, where the little auks gather, and how, hidden among the rocks, he catches hundreds of them in his home-made net. He could tell you how, in his wonderful little "kayak" or waterproof boat made of skin stretched over a bone framework, he



Danish Legation

### ESKIMOS NAVIGATING THEIR FRAIL LITTLE 'KAYAKS'

The Eskimos are in a limited sense a seafaring folk, for, while they do not undertake long voyages, they are largely dependent on the sea for food and transport. To the Eskimos of Greenland, kayaks—long narrow fishing and hunting boats for one person—are an essential possession, and they manoeuvre them with remarkable skill. Another craft of ancient design is the umyak, usually called the "woman's boat," for its crew in former times consisted only of women. Umyaks are used for long journeys

helps to land the great whale that the men of his tribe have harpooned.

You would like to see this harpoon. The point is detachable, and to it an inflated sealskin bag is fastened. This acts as a drag on the wounded animal, and when it is dead causes its body to float so that it is easily located by the hunters. Kessuh uses this same weapon when he surprises the walrus asleep on the ice, or when he sits patiently by the air-hole of the seal until, with a sudden stroke of the spear, he makes sure of seal blubber and a warm skin for the next winter.

But you would find it hard to talk with Kessuh, even if you knew his language. You would find that he has no word for school, church, train, motor-car, book, pencil and many other things of which you speak every hour. He knows only of ice and snow and of such animals as live in the very coldest parts of the world.

When your ride is over, Kessuh leaves you at your ship. You want to give him a present. There is nothing in the world he would like so much as your pocket knife, for he has never seen one like it. When you slip it into his hand and make him understand that it is for him to keep, he is so happy you are afraid he is going to rub noses with you. You watch him drive away, feeling very glad that you are not going back with him to sleep in his igloo.

**Esperanto.** Esperanto is much the most important of the many modern attempts to invent a new universal language. Volapük, which was given to the world in 1879 by a German priest, attained a measure of success, but, just when its triumph seemed assured, disagreement arose among the leaders.

Meanwhile, however, Esperanto was developed, and it soon outstripped all other artificial languages. It was the work of Dr Zamenhof (1859-1917), a Polish oculist, who presented it to the public in 1887, the name Esperanto coming from the Spanish for "hope." It uses sounds and words common to all the European languages. The grammar is very simple. Here is a stanza from a poem by its founder, with an English translation.

<i>Sur neutrala lingva fundamento,</i>	On a neutral lingual foundation,
<i>Komprenante unu la alian,</i>	Understanding one another,
<i>La popoloj faros en konsento</i>	The peoples shall form in agreement
<i>Uno grandan rondon familian</i>	One great family circle

**Essay.** It was in the tower of an old castle in France, not far from Bordeaux, in the month of March, 1571, that the first "essay" was written. Michel de Montaigne, a cultured French gentleman, had retired there to forget

the cares of the busy world, and to read and meditate in quiet. A desire to "preserve his memories" and "clarify his reflections" led him to write. He called the little book, which he began at this time and published in 1580, "Essais"—meaning "attempts" or "trials."

The term essay, which was soon adopted in England, thus suggests that the author is merely touching upon the subject in hand, and not treating it in detail, giving short, pithy comment rather than a complete and formal discussion, as in a "treatise" or "monograph."

"Myself am the groundwork of my book," said Montaigne, and, indeed, it is mainly the author's personality as he reveals it to us that makes a good essay. Unlike the novel or the short story or the drama, the essay does not aim at creating characters and through them telling a story. It speaks directly to the reader, giving the author's views on customs or happenings or people, on art, on books, or on life in general. It may teach, argue, persuade, arouse emotion, or merely amuse.

Though French in origin, the essay form appealed especially to the English. After Montaigne, an Englishman, Francis Bacon, was the next great writer of essays. He called his essays "certain brief notes set down rather significantly than curiously," and spoke of them also as "dispersed meditations." As a matter of fact, his essays are written with painstaking care. They are more formal and less personal than Montaigne's.

When magazines and newspapers began to be published, the essay became especially popular. In two periodicals, published in London in the beginning of the 18th century, the "Tatler" and the "Spectator," Addison and Steele wrote essays commenting on the life of the time, the most famous being the Roger de Coverley papers.

Then in the 19th century came one of the most delightful of essayists—Charles Lamb, who, though he hid under the pen-name of "Elia," revealed his whimsical, lovable personality as few writers have done. At about the same time Macaulay wrote essays of a very different type. They are carefully organized and noted for the clearness of their style and the splendour of their diction. Macaulay's essays—that on Milton, for example—may be taken as typical of the formal essay, just as Lamb's "Essays of Elia" are representative of the familiar or informal essay.

Of the essayists who followed, some leaned towards one type and some towards the other. Hazlitt, Leigh Hunt, Carlyle, Ruskin, Thackeray, De Quincey, Matthew Arnold and Stevenson are among the greatest essayists in England.

The essay, it should be noted, is essentially a prose form. Alexander Pope's "Essay on

Criticism" and "Essay on Man," in heroic verse, are poetic treatises, not essays, the same writer's "Moral Essays," however, have the substance, though not the form, of essays.

**Essex.** One of the south-eastern Home Counties of England, Essex is separated on the south from Kent by the river Thames, is bounded on the north by Suffolk and Cambridgeshire, on the west by Hertfordshire and Middlesex, and is washed on the east and south-east by the North Sea. Its low, flat seaboard is nearly 100 miles long, and is indented by shallow creeks. Inland the surface is undulating, rising in the north-west to nearly 500 feet. The area of Essex is 1,530 sq miles.

Harwich (pop 12,000) is the chief seaport, with steamer services to the Continent, and the county contains a number of popular seaside resorts, Southend, Frinton, and Clacton being the most favoured. There is little manufacturing away from the London area, though brewing is an active industry at Romford, and agriculture and oyster fishing are the chief pursuits. Wheat, barley, and fruit are produced, while the river Colne is famous for its oyster beds. An oyster feast is held every year at Colchester, a custom of early origin, while at Little Dunmow and Ilford are held the famous Flitch trials.

Chelmsford (26,000) is the county town, and there are also the populous boroughs or urban districts of Colchester (with important Roman remains and the ruins of a Norman castle), Walthamstow, Ilford, Leyton, East Ham, West Ham, Barking, and Romford. Tilbury, included in the Port of London, is an increasingly important port. At Dagenham, also on the Thames, are the extensive works of the Ford motor company; Tiptree is famed for its jam. Essex is well supplied with rivers, including the Thames, Lea, Crouch (with the famous yachting centre, Burnham), Stour, Blackwater, Colne, Chelmer, and Roding. Epping Forest, about 6,000 acres, is a public possession. Population, about 1,755,000.

**Esther.** In a beautiful Bible story we are told how the mighty king Ahasuerus of Persia (Xerxes, son of Darius I) chose from among all the maidens in his kingdom the one he deemed fairest to be his queen. This was a Jewish maiden named Esther although the king knew not who were her people or her kindred. Her father and mother were dead, and she had been brought up by her cousin Mordecai.

But shortly after Esther became queen, a great disaster threatened her people. A haughty man named Haman had been raised to the highest office in the kingdom, and he demanded that all should bow down before him. Mordecai refused to bow down, and for this Haman hated him so that he wished to destroy not only

## ESTHER

Mordecai himself but all the Jews. The king allowed Haman to do what was good in his own sight, and the wicked officer issued a decree that on a certain day all the Jews, young and old, throughout the kingdom should be slain.

When Mordecai heard the dreadful news he begged Esther to intercede with the king. Esther dared not approach the king, for there was a Persian law that anyone who entered the presence of the king without being called must die, unless the king showed mercy by holding out his golden sceptre. But at last she said, "I will go in unto the king, and if I perish, I perish."

Clad in her royal robes, Esther approached the king's inner court. Ahasuerus, seated on his throne, was so moved at sight of her that he held out his golden sceptre and bade her approach. "What wilt thou, Queen Esther?" he asked. "What is thy request? It shall be given thee, even to the half of the kingdom." Esther's only request was that he and Haman should come that day to a banquet that she had prepared for them.

When they were banqueting the king again asked Esther if she had any request, and she

asked the king and Haman to come again tomorrow to the banquet, and then she would tell the king what she desired of him.

Haman was delighted at being invited to feast with the king and queen. But when he saw Mordecai he was so angry that he caused a gallows to be made on which to hang him.

Now some time before this, Mordecai, as he sat at the palace gate, had chanced to overhear two of the royal chamberlains plotting against the king's life. He told Esther, and she warned the king. Thus the king's life was saved, and so it was written in the book of records. The night before the second banquet the king could not sleep, so he called his attendants to read to him from the records. And they read how Mordecai the Jew had saved the king's life. "What honour has been done to Mordecai for this?" asked the king. "Nothing has been done for him," was the reply.

While they were speaking Haman came into the outer court. The king bade him come in and said to him, "What shall be done unto the man whom the king delighteth to honour?" Then Haman thought to himself, "I am the man whom the king wishes to honour," and he



**RURAL ESSEX: A SUN FLECKED GLADE IN EPPING FOREST**

Years ago Essex was covered with forests, but Epping Forest is the only extensive stretch of woodland left. Formerly a royal hunting ground, it was acquired by the City of London as a public park and opened by Queen Victoria in 1882. Now part of London's 'Green Belt,' it is a great resort for bank-holiday crowds and other visitors during the summer. The new Underground Railway extension to this corner of rural Essex will soon make Epping practically a suburb of the Metropolis. The above picture shows Rangers Wood, near Chingford.

Photo J. Dixon Scott



replied, "Let the man whom the king delighteth to honour be arrayed in the royal apparel and the royal crown be set upon his head, and let him be placed on the king's own horse, and let one of the king's most noble princes lead him through the city and proclaim before him, 'Thus shall it be done to the man whom the king delighteth to honour'."

Then said the king, "Make haste and take the apparel as thou hast said, and do so even to Mordecai the Jew."

The next night when they were at the banquet, the king said to Esther as before, "What is thy petition? It shall be performed even unto the half of the kingdom."

Then Queen Esther said, "If I have found favour in thy sight, O king, spare my life and that of my people, for we are to be slain."

"Who is he that dares to do this?" said the king. And Esther answered, "Our enemy is the wicked Haman." The king arose in his wrath and went into the palace garden, and one of the servants showed him the gallows that Haman had built for Mordecai. "Hang Haman thereon," commanded Ahasuerus. And so they hanged Haman on the gallows that he had prepared for the execution of Mordecai.

Mordecai was raised to the highest office in the kingdom, and the day that was to have been a day of sorrow to the Jews was made a day of gladness. So is its anniversary to this day, for it is still celebrated as the festival of Purim.

**Estonia.** Bordered on the north by the Gulf of Finland and on the west by the Baltic Sea, the republic of Estonia is the most northern of Russia's former Baltic provinces.

It is a low, flat land, with many lakes, streams, and marshes. The climate is very severe—cold and raw in the winter and hot in the summer. Agriculture and live stock raising are the principal occupations. Rye, barley, hay, oats, and potatoes are the leading agricultural products, and enough cattle, sheep and pigs are raised to allow for the export of meat. The manufacture of iron and steel is considerable.

The Ests, or Estonians, who make up about 95 per cent of the population, are a Finnish people. In religion they are Lutherans.

When the Estonians first appeared in history, they were a primitive, warlike people, who lived largely by piracy. The country was first conquered and Christianized by the Crusading Order of Teutonic Knights. It passed into the hands of Sweden in 1561, and in 1721 was won



**ESTHER THE JEWESS IS CROWNED QUEEN OF PERSIA**

This picture, by José Villegas, the nineteenth-century Spanish painter, was inspired by the Biblical story of Esther. One of the reasons why we are told about her in the Scriptures is that we may understand the Jewish feast of Purim. Celebrating the escape of the Jews from Haman's plot, Purim is held about a month before Easter. The festivities resemble both Christmas and Guy Fawkes Day, for it used to be customary, in addition to feasting and present giving, to burn an effigy of Haman.





PEASANTS OF ESTONIA

Most people in the Baltic republic of Estonia are engaged in simple farm- or household-work. The logs these women are sawing will be much needed during the severe winter, which even moist west winds cannot alleviate much.

for Russia by Peter the Great. Thenceforth it remained under Russian rule until 1917.

Tallinn (Reval), with a population of about 140,000, is the capital and chief seaport. The area of Estonia is 18,353 square miles, the population, about 1,126,000.

**Ether AND SPACE.** Of what does space consist? What can we say about the vast stretches through which the earth, the sun and the most distant stars are moving?

We may be tempted at first to reply that space is simply emptiness. But that will not do, because in space things *happen*. Light, for example, travels across space, so do heat rays, so does the attraction of gravity. And to the human mind it seems impossible that action could be transmitted through an absolute void.

Early in the history of modern science, the ether theory was formulated and quite generally accepted. Ether was thought of as a material which filled all space, even permeating the areas occupied by ordinary matter. It was assumed to possess a variety of properties to account for its supposed action.

When Einstein's theory of relativity led to new mathematical descriptions of space and its phenomena, the ether theory was believed by

many scientists to be no longer necessary. Furthermore, the old theory implied that the drift of the ether past the moving earth ought to be measurable, but several elaborate experiments to detect this "ether drift" failed. Today some scientists continue to use the term ether with a much altered meaning, others have discarded it entirely in favour of the plain word "space" (See also Atom, Einstein, Albert).

**Ethics.** Is a starving man entitled to take food that does not belong to him? Are we ever justified in telling a falsehood? Why do we classify certain actions as faults, and others as virtues? These are all questions that belong to the field of "ethics," that branch of philosophy that deals with human actions from the moral point of view, as right or wrong, good or bad. Its field is character and conduct, and the moral judgements we pass upon them.

You might perhaps suppose that there is no difficulty in deciding between right and wrong. We know that we should not go out and murder our neighbours or steal their property, and the only moral problem that arises in such instances is a practical one, whether we shall do what we know is right. But there are cases in which we do not know what we ought to do. Suppose a manufacturer wants to pay his workers a living wage, but finds himself in competition with other people who do not. If he raises his wages, he goes into bankruptcy. What shall he do? In solving such problems ethics insists that we must act with reference to all the facts involved.

The term "ethics" is derived from a Greek word meaning "manners," "customs," or "habits" just as "morals" is derived from a Latin word with a similar meaning. Some philosophers—those of the naturalistic school—believe that our present ethical system is the outgrowth of very slow and unconscious alterations of these habits and traditions. Others, however, believe that standards are not truly ethical unless they are the result of reflection and conscious criticism of these habits and customs.

**Ethiopia.** When the Arabs conquered northern Africa, in the 8th century, they scornfully gave the name Abyssinia (from *habesh* or *habeshi*, meaning "mongrel") to the rugged part of ancient Ethiopia where many mixed Christian tribes took refuge. The modern inhabitants naturally resent the word, and the name Ethiopia is returning to general use. The word Ethiopia is derived from the Greek *aithein*, to burn, and *ops*, face and was originally applied to all countries inhabited by persons of dark brown or black colour. (See Abyssinia).

**Ethnology.** This word, derived from two Greek words meaning "race" and "science," and its fellow, ethnography, describe the study and the distribution of the races of Man. They are both branches of anthropology,

which is the name given to the general study of Man. In the ethnological sections of a museum you will find articles showing the habits and customs and mode of life of various peoples, often shown in such a way that similarities and differences between adjacent races can be compared and contrasted. Ethnographers map out the distribution and migrations, past and present, of the various races of Man kind. As you can see, much work in these sciences is done incidentally by travellers and explorers, but there are comparatively few people who devote themselves entirely to them.

**Etiquette.** (Pron et'-i-ket) The code of good manners which we call etiquette governs all our behaviour in social intercourse as well as in our business life. It teaches us how to conduct ourselves at the table, the usages to be followed by the host and hostess and guests at a dinner party or other entertainment, the correct clothes to be worn by a man or woman at a formal dinner, ball, or reception, and at an informal luncheon or tea. It teaches the correct usage in introducing people to one another—for instance, that a young person must be presented to an older one, and a man to a woman.

Etiquette sets forth certain forms for formal invitations and for accepting and refusing them, certain forms of address for business correspondence, and others for social correspondence. In fact, etiquette prescribes a thousand and one little niceties of behaviour which go to make up the conventional "good manners" that rule in any given society. The groundwork of etiquette is always thoughtfulness for others,

courtesy, and a gracious manner.

Table manners are of the greatest importance, and a lack of them is inexcusable. Sit upright at the table and do not slide down on your spine or sprawl forward on your elbows. Lay your napkin across your lap, don't tuck it in your collar.

Don't fidget with your knife and fork,



Sit upright at table, and do not tip your plate to get the last spoonful.

drum with your fingers, or tap your foot on the floor. Don't make a noise when eating and drinking, or take enormous bites, or chew with your mouth open. When eating bread with a meal don't bite into a whole slice, but break the bread into suitable pieces for eating and butter each piece separately. It is usual, however, to bite into a whole sandwich. Don't bend over your plate and give the effect of shovelling your food into your mouth, and don't reach for things

When having soup fill the spoon from the edge that is furthest from you, and take the soup from the near side, not from the tip of the spoon. If soup is served in cups it is customary to use a spoon for the first part and drink the remainder from the cup.

Table-talk is a fine art. Because unpleasant thoughts interfere with the enjoyment and digestion of food, disagreeable topics must not be mentioned at table. Table talk is light, never argumentative or very serious, and should be as general as possible.

When you have finished eating, drop your napkin unfolded beside your plate, since at a dinner party a napkin is not supposed to be used again, and lay your knife and fork on your plate, side by side, not crossed.

The most important thing to remember about behaviour in the street and in public places is not to interfere with others or to draw attention to yourself. When a gentleman meets a lady it is she who should smile or speak first. A gentleman lifts his hat to women. If a gentleman wishes to talk with a lady it is correct to turn and walk in her direction. And when he is walking with a lady, a gentleman lifts his hat to anyone she recognizes, whether known to him or not. The lady, however, does not recognize his friends unless they are known to her also. A young man should raise his hat on meeting elderly male acquaintances and persons of importance.

When a gentleman is with a lady, he takes the outside because that is the more exposed place. A gentleman who enters a vehicle with a lady helps her up the steps and follows her. In leaving he gets off first and helps her down.

The kind of behaviour required in a well-conducted school room is expected in church, theatre, concert, and lecture hall, libraries, and art galleries. A lady should take off her hat whenever she sees that other ladies have done so. In church it is bad manners to look at a watch or to leave before the services are over. One may leave a theatre or concert, quietly, between the acts or numbers—never in the middle of one.

Never resent the behaviour of an ill-bred stranger. If he wants more than half the pavement let him have it. Remember, no one can insult you. He can simply show his own bad manners. But no man or boy should stand by and see a bully abuse an animal or a child or other defenceless person.



When out-of-doors a gentleman always walks next to the roadway, because that is more exposed to dirt and danger.

Conversation is not really a very difficult art, but very many young people complain that they do not know what to talk about in society. Talk about pleasant things. The German poet Heine once said "God has given us speech in order that we may say pleasant things to our friends." A pleasant voice, low, clear, with a rising inflection, makes the most ordinary words sound pleasantly in the ear. Don't let your voice drop or your mouth sag at the corners. Look into the eyes of the person who is talking to you. In answering speak distinctly. If you wish to have something repeated, say, "I beg your pardon, Mr ——" Use "please" and "thank you," and "pardon" freely.

Except when in the company of intimate friends don't talk about yourself or your activities. Don't interrupt people or help anyone to tell a joke. Remember the words of King Arthur to his knights "Speak no slander, no, nor listen to it." A malicious story may not be true—it is certainly unkind, and it should not interest you. Rebuke scandal by silence and by changing the subject. Talk of things and ideas, not persons, except interesting public persons like politicians, actors, authors, artists, and musicians, whose talents give wide pleasure. Be brief, be merry and bright. Draw out other people, and be more ready to listen than to talk. Intelligent listeners are

scarce and popular. If asked to sing, play, tell stories, or join in a game, do so.

In making an introduction the gentleman is always presented to the lady, and the younger lady to the older. It is sufficient simply to mention the two names, as "Mrs Miller, Mr Jones", but it is rather more dignified to say, "Mrs

The gentleman is always presented to the lady in making an introduction.

Miller, allow me to introduce (or present) Mr Jones." The people who meet are not required to say anything—a smile and bow are sufficient, and an air of deferential attention is more eloquent than words. It is perfectly good form, however, to say, "How do you do, Mr Jones?" On being introduced people shake hands or not, as they choose. Two men usually do so.

It is the usual modern custom at evening parties for the guests to converse freely with those nearest without previous introduction.

Everyone has occasion to write letters and notes of business, friendship and courtesy, and should be supplied with proper materials. Post-cards are correct for impersonal messages and

business notes, linen writing pads, with envelopes to fit the folded sheets, are convenient for generous family letters, note-paper with ruled lines is vulgar, and should never be used. For social correspondence note-paper, of which there are three sizes, in cream-laid or white linen bond paper, is first choice. You may have your address, initials, or monogram engraved at the top of the sheet, or embossed—raised—on a heavy quality of paper and left uncoloured.

#### How to Begin a Business Letter

A business letter should be begun with the full name and address of the person written to, thus "Lawrence Bassett, Esq, 999, Norwich Street, Edinburgh," arranged compactly in three lines at the left and followed by "Dear Sir." It is also good form to begin a business letter directly with "Dear Sir" or "Dear Madam," and then put the name and address of the person addressed at the end, below and to the left of your own signature. In social letters, however, one omits entirely the address of the person written to. A business letter ends with "Yours faithfully" "Yours truly" is properly used with business houses with which one has been long on good terms, and "Yours sincerely" with acquaintances and with friends. With relatives or intimate friends, one should use "Affectionately yours," "With love," or any term that correctly expresses your real feelings. A married woman signs her own name thus "Margaret Boyd." If the letter is to a stranger who does not know how to address her, she should put her married name in brackets below and to the left of her signature, thus (Mrs John Boyd). An unmarried woman indicates the fact by putting "Miss" in brackets before her name. Any woman, married or unmarried, is addressed as "Dear Madam" in a letter by a stranger. A letter should be begun on the first page of the sheet, and the pages should be used consecutively.

Letters of introduction and messages carried by friends should

not be sealed. In addressing a letter put the full name on one line, the street number and the street on the line below, and the town and county on the third line. Put the stamp in the upper right hand corner, right side up.

**Etna, Mount** On the eastern coast of the island of Sicily, two hundred miles almost due south of Mt Vesuvius, towers the "burning mountain" of Etna—older, much higher, and grander in its eruptions (though less frequent)



The gentleman is always presented to the lady in making an introduction.



When a letter is entrusted to a friend for delivery it should not be sealed.



SNOW CAPPED MOUNT ETNA

EVA

The lower slopes of Etna, because of their extraordinary fertility, are thickly populated. But when the Mount is in eruption, the people have to run for their lives, or they may be swamped by hot lava nine or ten feet deep. Above is an interesting photo of Etna covered with snow in springtime.

than its sister. More than 80 eruptions of Etna are on record, the earliest about 479 B.C. In A.D. 1169, 15,000 inhabitants of the neighbouring town of Catania were destroyed, and again in 1669 some 20,000 perished. In 1792 there was an eruption which lasted for a whole year, that in 1892 lasted six months. There was a destructive eruption in 1928. Over a dozen major eruptions have occurred in the past century.

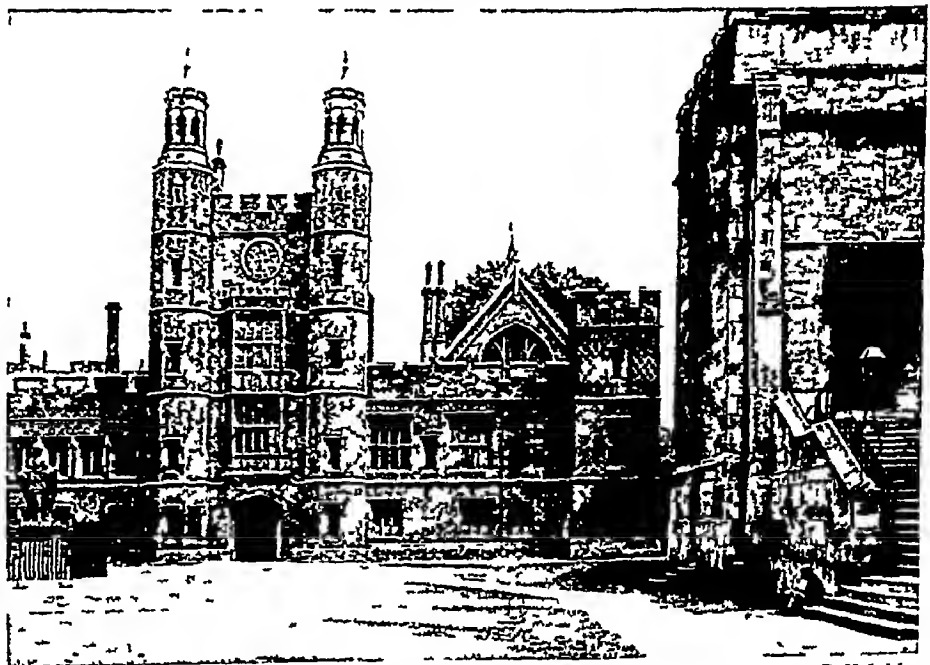
In spite of these terrors, villages and farmhouses nestle close on the broad expanse of Etna's flanks. The mountain rises through three zones—the cultivated region, of about 2,000 feet, where date palms, bananas, oranges, lemons, olives, figs and almonds are grown, the wooded region in the middle, planted with forests of chestnut, cork, beech, pine, maple and oak, and the

desert region, beginning at about 6,300 feet from the base of the mountain, a dreary waste of black lava, ashes and sand, snow covered through a large part of the year.

A famous chestnut tree, one of the largest and oldest trees in the world, formed by seven trees grown together, with a circumference of 163 feet, grows in the wooded region of the slope. A volcanic observatory, 9,075 feet above the sea, was built in 1880, and is the highest inhabited house in Europe, being 1,000 feet higher than the shelter on the Great St. Bernard in the Alps.

The summit of Mt. Etna is about 10,750 feet above the sea, while its base is 90 miles in circumference. A great part of the world's supply of sulphur is secured from the craters of this mountain, which the Sicilians call "Mongibello," "mountain of fire."

**Eton.** This town of Buckinghamshire stands on the north bank of the river Thames, opposite Windsor. Its fame is due entirely to its college, which is the largest of the old English schools, and is acknowledged to be the most famous school in the world.



D. McLeish

ETON COLLEGE THE MAIN QUADRANGLE

This quadrangle is known to Etonians as the School Yard. Facing us is the fine red brick Lupton's Tower, dating from 1517, a monument to Roger Lupton, who was Provost of Eton from 1503 to 1535. On the right we see the entrance and part of the Chapel begun in 1444.

This was built on a raised platform of stone to lift it above the Thames flood-level.

The "King's College of Our Lady of Eton beside Windsor" was founded by Henry VI in 1441. Most of the original structure still stands, but the college in modern times has far outgrown its ancient buildings, and new ones have been added from time to time.

Many famous men, including royal princes, have been educated at Eton.

Speech day, the principal annual celebration, is held on June 4, the birthday of King George III. On St Andrew's Day, November 30, there takes place a peculiar contest called the "wall game," a kind of football.

Rowing and cricket are other sports engaged in, the school excelling at the former. Population, 2,000.

**Etruscans.** In Italy, long before the days of Rome's greatness, there dwelt a people far advanced in civilization and culture—the Etruscans, or Tyrrhenians as they were called by the Greeks. The "mystery race" of Italy, they rose to prosperity and power, and then vanished completely from the stage of history.

The Etruscans taught Rome much of her art and science, and they gave her many of her social, religious, and political customs and institutions. Their blood mingled with that of the warlike Romans and still flows in the veins of the Italians of today. But the language of their inscriptions has been only partially deciphered, and only in the few remains of their ancient buildings and monuments—most of all, in their tombs—can we read their puzzling, but fascinating story.

As we see them in the paintings on the walls of their tombs, the Etruscans were a short, thick-set people, fond of rich garments of graceful lines and bright colours. Their religion was sombre and mysterious, and they dwelt much on the life after death. Otherwise they were fond of good living, games and amusements, dancing, music, and the theatre. The women were noted for their rich jewelry, many articles of adornment, together with mirrors of polished bronze, have been found in their tombs.

Weapons and other implements, beautiful vases and statues of stone, bronze, and terracotta show that the Etruscans were skilled craftsmen. But most of their work was imitations of earlier Greek craft.

It is thought that the Etruscans were a seafaring people from somewhere in or near Asia Minor. As early as 1000 B.C. we find them settled in Italy, between the rivers Arno and Tiber, in the district which corresponds roughly to modern Tuscany and which was then known as Etruria. At one time their rule embraced

the greater part of Italy, including Rome. When the Tarquins were expelled from Rome, about 500 B.C., Lars Porsena of Clusium sought in vain to re-establish the Etruscans.

Driven from Rome, the Etruscans sought power in other fields. They already controlled the commerce of the Tyrrhenian Sea on its western border, and now they strengthened their naval power by means of an alliance with Carthage against Greece. But in 474 B.C. their fleet was destroyed by the Syracusans, and from then onwards their power rapidly declined. The Gauls overran their country, and their fortress of Veii fell to Rome after a ten years' siege (396 B.C.).

**Etymol'ogy.** This term means the tracing of a word as nearly as possible to its original form and meaning and includes the branch of philology, or the science of language, concerned with this process. The word "etymology" is derived from *-oi*, in other words, its etymology is—the Greek word *etymon*, meaning "what is true,"

neuter of *etymos*, and the Greek combining form *logia*, from *logos*, science. The term itself dates back to the early schools of Greek philosophy, but for many centuries the derivation of words was mainly guesswork. Plato, in one of his Dialogues, poked fun at some of the astonishing etymologies then current, and in a later age Dean Swift (who jokingly suggested that "ostler" was a corruption of "oat stealer") made merry at the expense of the etymologists.



**ETRUSCAN FIGHTING MAN**

The Etruscans were not outstandingly good at either commerce or art, but they were formidable fighters. However, not all their abundant bronze was used for weapons, some of it made attractive little statuettes like this one, which dates from the 5th century B.C. Archaeological Museum, Florence.



## UCALYPTUS

Etymology as a science did not become possible until a knowledge of Sanskrit was introduced into Europe by the famous Orientalist, Sir William Jones (1746-1794). This led to the comparative study of the formation of the Indo-European languages and the establishment of certain fixed principles of sound-change (e.g. Grimm's Law, which deals with the changes in consonant sounds) (See also English Language)

**Eucalyptus.** The tallest tree in the world, according to some authorities, is the *Eucalyptus amagdalana*, a member of a great and valuable group of gum trees, native to Australia. The specimen which holds the record was found fallen in the colony of Victoria and measured 470 feet in length.

The tall white stems of these trees, smooth as marble columns, frequently rise over a hundred feet from the ground without a branch. From such giants down to small bushes, the members of this group, which contains more than 150 species, are among the most beautiful, interesting, and useful trees. The wood is very tough and durable, and is much used for ship and wharf-building because it resists decay in the water. It takes a high polish, and so is valuable for interior furnishing. Certain eucalyptus trees have a gummy sap, yielding tannin.

The inner bark of some species consists of very tough long fibre, used for rope making, paper, and thatch. The leaves, which in many species turn edgewise to the sun, furnish the eucalyptus oil used in medicine for its germ-killing and stimulating properties.



BESIDE THE 'GREAT RIVER EUPHRATES'

The valley of the rivers Euphrates and Tigris, irrigated thousands of years ago, was once extremely fertile. Here arose some of the earliest cultures in the world. But, as in Egypt and other 'cradles of civilization,' life there is very simple nowadays, and these women with their water jars beside the Euphrates care little for progress.

Photo American Colony Jerusalem

## EUPHRATES

The name eucalyptus comes from two Greek words meaning "well covered," referring to the abundant foliage. Because this enormous leaf area enables them to evaporate into the atmosphere the vast quantities of water absorbed by their roots, eucalyptus trees are often planted in swamps, which they help to drain. It is this faculty for drying up mosquito marshes, rather than their pungent odour, which has won for them their reputation as safeguards against the deadly malaria-carrying mosquitoes. Various species have been transplanted with success in America, from Australia.

The eucalyptus genus belongs to the family of myrtles, *Myrtaceae*.

**Eugenics.** Two thousand years ago Plato asked "If care were not taken in the breeding, would not your dogs and birds greatly deteriorate? And what if the same principle holds of the human species?" Today we are asking the same question.

Eugenics (from the Greek *eugenes*, "well born") as a science dates from the last quarter of the 19th century, when the term was coined by Sir Francis Galton in his book, "Inquiries into Human Faculties." He defined the science as "the study of the agencies under social control that may improve or impair the racial qualities of future generations, either physically or mentally." Practically, this simply means control of the unfit—the feeble minded, diseased, and criminal—most of whose children sooner or later become wards of the state. Segregation of the feeble-minded and those otherwise physically

unfit is much advocated, and is an increasingly popular method of dealing with the problem, while in some countries sterilization of the unfit has been attempted in an effort to improve the standard of a race. The intense "nationalism" of modern Germany and the stimulation of prejudice against intermarriage between white and coloured peoples have the same end in view. (See Heredity)

**Euphrates, RIVER** (Pron *ū frā'-tēz*) After the Nile, the Euphrates, which is the largest river of Asia Minor, is probably the most famous stream in history. It rises in the heart of Armenia and flows south, breaking through the Taurus Mountains in a succession of rapids and cataracts for about 40 miles. At Korna the



Tigris joins it, and with the new name of Shatt-el-Arab it empties itself by several arms into the Persian Gulf, 1,800 miles from its source.

It is navigable for small boats for nearly 1,200 miles, and steamboats ascend it to its junction with the Tigris.

In ancient times, by a system of canals and embankments, the river was used for irrigating the country as the Nile is used in Egypt, but the works were not kept up. Today there is little to suggest the fertility and culture of 5,000 years ago (See Iraq). The Euphrates is mentioned in the Bible as one of the four rivers of the Garden of Eden. It is called the "great river." The city of Babylon was situated on its banks, and Nebuchadnezzar had locks and dykes made to enable large vessels to sail up the river as far as the city. The river figured prominently in the Mesopotamian campaign of the World War.

**Eurhythmics.** (Pron ūr ith'-miks) About 1910 the Swiss professor E. J. Dalcroze opened a school of eurhythmics with the intention of simplifying the teaching of music. The purpose of his system, which has since become adapted to many different situations, was "to create by the help of rhythm a rapid and regular current of communication between brain and body." Eurhythmics, as we now know it, is regarded as a system of rhythmic exercises, used simply for self-expression, for the treatment of nervous diseases in children, and for teaching the development of a sense of rhythm. As you can see, therefore, eurhythmics can help you in all sorts of ways, it is useful for a ground work in dancing, as a means of obtaining exercise, for helping you to understand music, teaching you how to breathe and for keeping your nerves as



A GROUP OF EURHYTHMIC DANCERS

Topical

These girls are dancing to the tune of an old Breton folksong. Eurhythmics is a pleasant way of learning music, as well as dancing, it is based partly on Greek dance movements. The dancer's feet move with the notes of the melody, the arms mark the time. Not all the dancing is planned by the teacher, for freedom of expression and improvisation play an important part in Eurhythmics.



EURIPIDES

The plays of this ancient Greek dramatist were written according to classical tradition, but his mind was as original as Bernard Shaw's. This statue is in the Vatican at Rome.

well as your body in good trim. It is hardly surprising therefore that large numbers of schools teaching this system have arisen all over the world, or that many other branches of art and exercise have been influenced by Dalcroze's invention. Even the Russian ballet (see Ballet) through the famous dancer Nijinsky, was influenced in this way, since the ballets which he devised largely showed the interest he took in eurhythmics.

**Euripides.** (Pron ūr-īp'-ī dēz) (480-406 B.C.) Tradition says that this great Greek dramatic poet was born on the very day of the Greek naval victory at Salamis, whither his parents had fled for refuge. His father was a merchant of Athens, and his mother was "of very high family," though the comic poets of the time said she had been a seller of herbs. In youth Euripides was a famous athlete, and a painter. The last few years of his life he spent at the court of King Archelaus in Macedonia.

He presented his first play at the age of 25, but did not take the prize offered for

the best tragedy until he was 39, and, although he wrote over 90 plays, he won the prize only five times. The reason for this is that he was a modern among the ancients. He questioned the popular idea of religion, and he drew real men and women instead of gods and demi gods or idealized human beings of heroic stature. This is why Aristotle calls him "the most tragic" of the poets, for his plays, being the most human, were also the most moving.

The tragedies of Euripides are more frequently performed on the modern stage than those of any

other Greek poet, and to English speaking people he has become the most living of all the Greek dramatists, thanks to the splendid verse translations of Professor Gilbert Murray. Among the 18 plays that have survived are the "Alcestis," notable for its picture of woman's devotion, the "Medea," regarded as among his masterpieces, "Hippolytus," the tragic love story of Phaedra, "Hecuba," the story of a barbarian queen driven mad by suffering, the "Trojan Women", "Electra," a study of a blood feud, and the "Bacchae," glorifying the worship of Bacchus.

## Taking a BIRD'S-EYE VIEW of EUROPE

*Though the smallest but one of the six continents, Europe has an importance and interest out of all proportion to its size. This article describes its general features, details are left to the articles on the individual countries*

**Europe.** Europe is truly the centre of the modern world. Packed into Europe's small compass are more great nations than you will find in all the rest of the world put together. By a series of rail

way, aeroplane, or steamboat journeys, each only a few hours long, you may hear a different language every day for several weeks. You can see

the cities and the battlefields where most of the history of the world has been made for the past 2,000 years. Nor is any region of the world more delightful to the traveller. How rapidly the scene changes from the woods and green fields of England to the carefully cultivated valleys of France, from the mountain pastures of Switzerland, knee deep in flowers, to the olive groves and vineyards of Spain and Italy, and from the canals and windmills of Holland to the deeply cleft fiords of the coast of Norway!

Europe has been the favoured continent of civilization. It has no such barriers of desert and mountain as Asia (of which it is in reality a western prolongation), no such vast distances, no such extremes of temperature. It lies entirely outside the tropical zone and almost entirely outside the frigid zone. Its average elevation above the sea is the lowest next to that of Australia. These two advantages, combined with the warm winds blowing from the Atlantic, give it the mildest and most genial climate of all the land masses in the same latitude, as well as a wide distribution of rainfall.

**Extent**—North to south, 2,400 miles, east to west, 3,000 miles, area about 3,750,000 square miles. Population, about 447,000,000.

**Mountains**—Northern system, including mountains of Scotland and Scandinavia (highest point 8,540 feet), southern system, including Pyrenees, Alps, and Carpathians, with Apennines and Balkans as offshoots (highest point, Mt Blanc 15,782 feet). The Ural Mountains (highest, about 5,540 feet) and Caucasus Mountains (Mt Elbruz highest peak in Europe 18,470 feet) separate Europe from Asia.

**Rivers and Lakes**—Chief Rivers: Rhine, Elbe, Oder, Vistula, Dvina, and Pechora flowing northward into the North Sea, Baltic, or Arctic Ocean; Rhône, Po, Danube, Dniester, Dnieper, and Don flowing south into the Mediterranean, Adriatic, or Black Seas. Volga and Ural flowing south into the land-locked Caspian Sea. Largest lakes: Ladoga, Onega, and Peipus in Russia, Wener and Wetter in Sweden with numerous smaller lakes in Finland and in the Alpine region in the heart of the Continent.

Half the secret of the even temperature of this continent lies in its sea coast—20,000 miles of it if you take only the important indentations, and 50,000 or 60,000 or even more if you count every little bay and inlet—about one mile of coast for every 75 square miles of area. Besides being a long coast it is a western coast. This means

that the warm west winds from the ocean make the western edge of a large land body much warmer than the eastern, and so you will not be surprised to learn that sunny Venice is slightly farther north than the harbour, often icebound, of Vladivostok in Siberia.

### Voyaging through the Mediterranean

If you should take ship as far to the south east as possible, you would come first to the little Russian peninsula of the Crimea reaching down into the Black Sea. Then, sailing through the Bosphorus at Istanbul, the Sea of Marmara, and the Dardanelles, you would travel far to the south to skirt the Balkan peninsula, at the end of which is Greece. Continuing westward, you would come to Italy. Then, sailing the last half of the length of the blue Mediterranean, you would come to the Iberian peninsula, which includes Spain and Portugal.

This is the second largest of all the peninsulas of Europe. It is so broad and high that, except for the low-lying rim, it has a continental rather than an oceanic climate. Continue through the Strait of Gibraltar, round Portugal, across the Bay of Biscay, through the English Channel

## EUROPE

and into the North Sea, and presently you will come to the peninsula of Denmark jutting north from Germany. Just opposite is the Scandinavian peninsula, the largest of all, shaped something like one of the warm woollen mittens you would need to wear there in winter.

### Seaports Away from the Sea

The long, deeply-indented sea-coast means commerce as well as a temperate climate. At first you will be surprised to find that most of the important seaports on the Atlantic lie well inland. Hamburg is 75 miles up the Elbe, and Bremen is about 50 miles up the Weser. Amsterdam lies at the end of a sea canal, Rotterdam some distance up the Rhine, and Antwerp at the head of the estuary of the Scheldt. Hull is on the Humber, and London on the Thames, both some miles from the river mouth. So it is with Rouen on the Seine, Nantes on the Loire, Bordeaux on the Garonne, Oporto on the Douro, Lisbon on the Tagus, and Seville, which is no less than 70 miles inland, on the Guadalquivir. But, you might ask, do not the great ocean liners and tramp steamers have a hard pull to work their way so far inland? They would but for the fact that all these rivers have wide tidal mouths, or estuaries, and that twice a day the strong tides of the Atlantic increase the depth of their waters. It is no accident that these ancient ports lie so far inland. Their founders established them at the highest *fordable* part of the tidal river to serve the commerce of both banks, and to make them less vulnerable to attack.

The Mediterranean, unlike the Atlantic, commands no great navigable rivers. You will notice that the Ebro, the Rhône, and the Po are the only large rivers flowing into it or any of its arms. Of these the Rhône is too swift, and the others are at certain seasons too shallow for sea-going vessels. Nor would the Mediterranean river ports—if there were any—have the advantage of tides enjoyed by the Atlantic ports, for the Mediterranean tides are in general slight.

### Rivers that Begin with 'D'

The ports of the Black Sea are of comparatively little importance, with the exception of Odessa, although into it flow four great navigable rivers—the Don, the Dnieper, the Dniester and the Danube. The Danube is the second river of Europe, and forms the great highway between Central Europe and the East. The Caspian receives the largest river of Europe, the Volga, which is navigable for 2,200 miles out of its 2,325, but is icebound for 100 to 150 days out of the year. This fact, together with the accident of its emptying into the land-locked Caspian, makes it chiefly important for local traffic along its course. The same is true of the northern rivers, the Pechora flowing into the Arctic, and the Dvina into the White Sea.

These rivers are icebound for more than half the year, and only during the summer months can timber, furs, and grain be brought to Archangel for export. A series of new canals is now, however, improving river communication in Soviet Russia.

Europe's long sea coast creates industries of its own as well as promoting commerce. Fleets of fishing-boats dot nearly its entire length, and push boldly far out into the open sea—to Arctic Iceland and the distant Banks of Newfoundland. In the Baltic and North Seas the fisheries are practically inexhaustible.

Near the fishing grounds the curing of fish is an important industry. Olive oil and sheet-tin for tinning sardines are among the largest imports of Norway, and smoked, salted or pickled cod, salmon and herring are produced in large quantities. "Kippers" and Yarmouth "bloaters" (forms of herring) from Great Britain, and anchovies and sardines from the Mediterranean and the Atlantic coast of Spain and Portugal are exported to every country.

### Looking Down on Europe

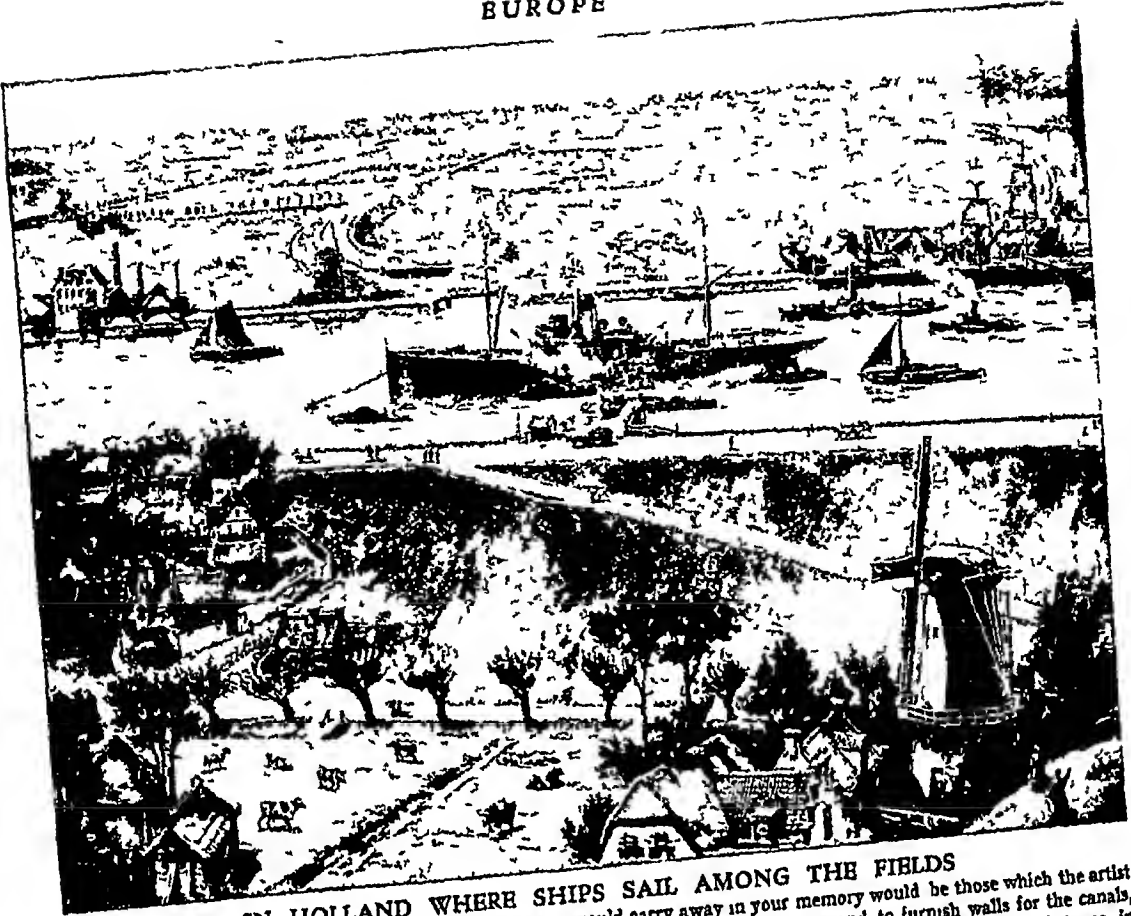
How would the continent of Europe look if we could view it from high in the air and see its whole extent as a great panorama stretched out before our eyes? Imagine that we are hovering far above the Alps—the roof of Europe—in an aeroplane equipped with instruments powerful enough to see any part of the continent.

First, look straight down. Under our feet lie the snow-capped peaks of the Alps, rising from valleys dotted with lakes and green patches of mountain meadows. This magnificent mountain range, from 10,000 to 15,000 feet high, is one of the many ranges of young rugged mountains of southern Europe.

As we turn our eyes to the south, we see the Alps falling steeply to the low fertile Po river basin, the plain of Lombardy. This is perhaps the most productive region of Europe, its meadows may be mown six times in the year.

On both sides of the Po valley the Alps thrust out long fingers to the south-east—jagged ranges, but not so high as the central mountains. One of these, the Apennines, forms the backbone of Italy, reaching far into the Mediterranean and nearly joining Europe and Africa by way of the island of Sicily. On the eastern side of the Adriatic Sea we observe the Dinaric Alps, continued by the huge, broken, sprawling mass of highlands which make up the Balkan peninsula, the Balkan mountains pushing east to the Black Sea, and the Pindus range dividing Greece.

Swing your gaze slowly eastward. Notice how the lines of the eastern wing of the Alps are prolonged north-eastward across the Danube by the grand sweeping curve of the Transylvanian Alps and the Carpathians, which circle round the plain of Hungary. In this mountain girdled



### IN HOLLAND WHERE SHIPS SAIL AMONG THE FIELDS

After a summer in Holland among the principal things you would carry away in your memory would be those which the artist has brought together in this picture—the coast line with its dykes to keep back the sea and to furnish walls for the canals, which are so vital a part of Holland's transport system, the roads with their bordering trees like those in the distance, in the top left-hand corner, marshy lands partly flooded (to the right) with a large canal or river in the centre, crowded with big and little boats. Just this side of the marshy land is a "polder," a morass which has been drained and is now cultivated

basin great waving fields of wheat, maize, flax and rye alternate with treeless steppes where millions of horses, sheep and cattle are grazing.

The lower basin of the Danube, separated from the Hungarian plain by the gorge of the Iron Gates, is a far-stretching expanse of treeless plain. There the Rumanians raise their wheat and maize and pasture extensive herds.

Now let your gaze travel towards the north. In the far distance—2,000 miles from your aeroplane—you dimly see the long low range of the Urals, which forms 1,200 miles of the boundary between Europe and Asia. These are old worn-down hills, the mere stumps of mountain ranges that once rose steep and high, reaching from the Arctic Ocean almost to the Caspian Sea.

Cast your eye over the Russian plain between the Carpathians and the Urals. Nearly the whole of it is covered with enormous grasslands and fields of wheat and other grain, potatoes and sugar-beets, alternating with woods and marshes.

In the far south, near the Black Sea and the Caspian, the plain becomes a treeless steppe, pasturing the herds of wandering inhabitants. Around the margin of the Caspian, in the basin which that sea once occupied, the soil is so filled with salt that few plants will grow.

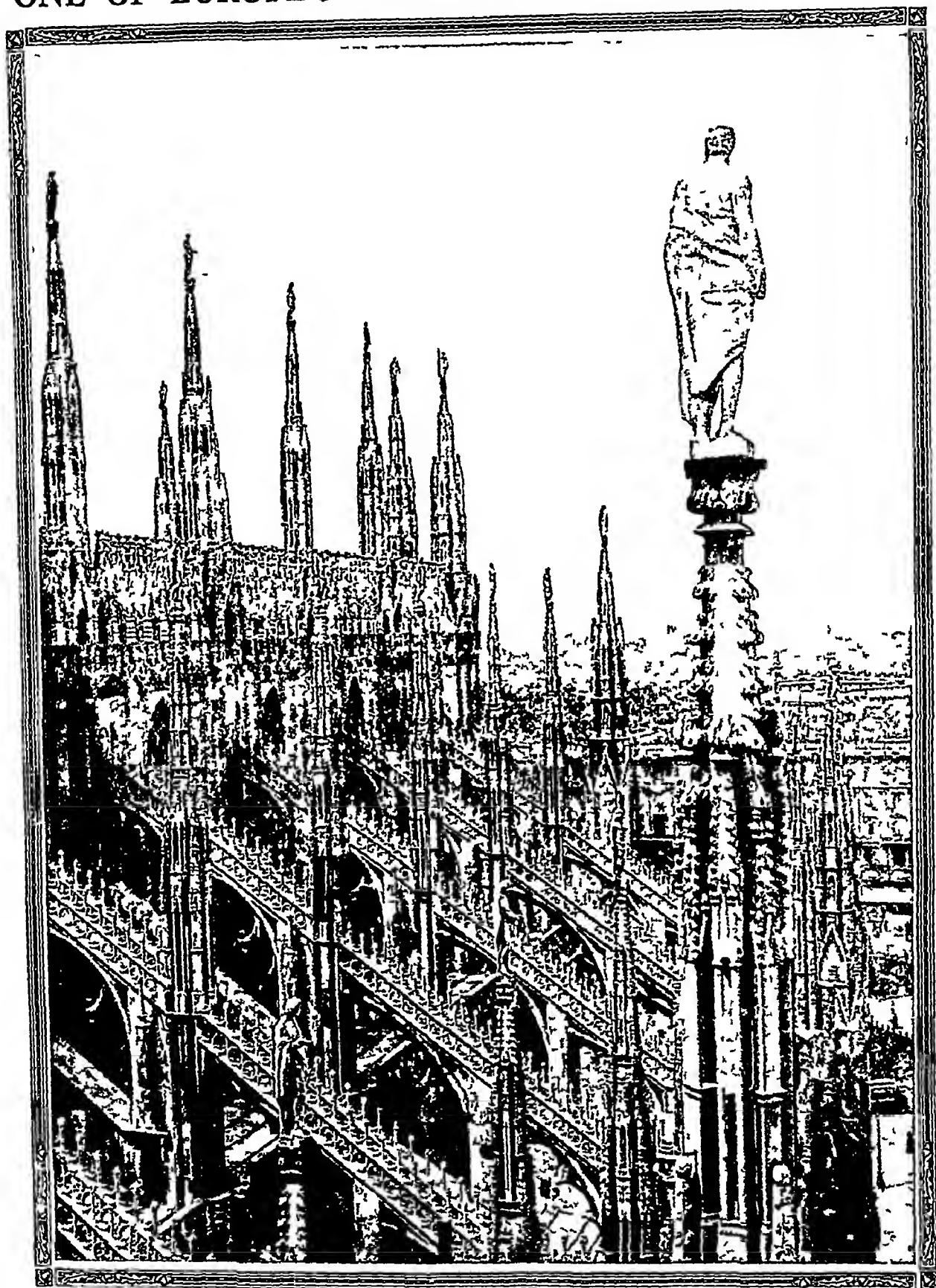
In the far north, next the icy Arctic Ocean, the plain takes the form of the moss-covered swamps called "tundras," which never thaw for more than a yard's depth. Here grow only mosses, lichens, dwarfed trees—many only a few inches high—and a few hardy plants.

We let our gaze travel on, following the line of the Arctic Ocean to the west. Plains, nothing but plains, until we spy the forest-covered hills of Finland between the Arctic Ocean and the Baltic Sea with its girdle of cliffs rising steeply from the sea. Its granite floor of old worn-down hills is broken into thousands of angular lake basins, which cover its surface in a network.

Looking still farther west, we observe that the upland of Finland rises into the broad highland mass of the Scandinavian peninsula, which reaches south between the Gulf of Bothnia and the Atlantic. The mountains of Sweden and Norway have been worn down by the ages into a series of broad plateaux dotted with clear blue glacial lakes. Their base, too, has sunk deeper into the ocean, allowing the sea to enter the valleys and making the steep-walled fiords which everywhere cut Norway's Atlantic coast.

Follow the line of the Scandinavian peninsula south-westward to the British Isles across the

## ONE OF EUROPE'S MOST BEAUTIFUL CATHEDRALS



Nowhere in the world is there on one building a greater wealth of spires and statuary than that which enriches Milan's late 14th century cathedral. The closer we get the more beautiful they are, for every detail, almost every stone, has been wrought with loving care into a beautiful ornament. This view shows how this ornamentation has been carried out among the "flying buttresses" which support the walls of the cathedral. There are altogether 98 of these spires on the church and more than 2,000 statues



## A GEM IN EUROPE'S MOUNTAIN CROWN



This mighty peak in the Alps is known as Plz Bernina, and is 13 295 feet above sea level. It rears its snow-capped summit in southeastern Switzerland, near the Italian border, and looks northward across the famous Upper Engadine Valley. Those men in the picture must be hardy climbers, for the ascent is one of the most difficult in this whole region. Quite apart from their beauty, the Alps are of great importance to Europe. Their snows feed great rivers that water the fertile fields of France, Germany, Austria, and Italy, and they supply cool breezes for the surrounding plains.



## EUROPE

**North Sea** If we could look down through the waters to the ocean bottom, we should see that the North Sea is far shallower than the rest of the Atlantic. In fact, the North Sea is a drowned plain which once rose above the surface of the ocean and joined the British Isles with continental Europe. This whole region has now sunk so far beneath the waves that only the high plateaux and tops of the mountains still remain uncovered, forming the British Isles.

### Europe's Great Plain

Now look back to the great plain—the "bread basket" of Europe. Notice how it continues westward along the Baltic, forming the fertile lowlands of the post War Baltic states of Estonia, Latvia, Lithuania, and Poland. Farther on it forms the northern half of Germany, with the little Danish peninsula jutting north as if to meet the Scandinavian. As it swings to the south along the North Sea, it narrows down, forming Holland and the lowlands of Belgium—much of it so low that it is actually below the sea level and is only prevented from being drowned like the rest of the old North Sea plain by a great, elaborate system of dykes.

In north western France the plain enlarges, forming the fertile Paris basin. On it goes, past the plateau of Brittany—once a part of the chain of mountains that ran all the way in a great semicircle through the British Isles to Scandinavia—again expanding to form the wine and wheat district of the Garonne valley.

Here our attention is drawn to the formidable barrier of the Pyrenees, the young and rugged range which completely shuts off the Spanish peninsula from the rest of Europe, except around its flanks. On the other side of the Pyrenees we see the dry barren plateaux of Spain, traversed by chains of mountains and bordered by narrow strips of lowlands along the coast.

We have now viewed the whole of the continent of Europe, and noted its most important natural features, except for the central highlands that slope north and west from the

Alps to merge into the long coastal plain. Now look north-west, across the Rhone. The central highlands here are the treasure house of Europe. They contain most of the great iron and coal mines on which the industrial prosperity of Europe depends, and they are rich in many other kinds of minerals, as well as in water power and timber.

Although Europe is the smallest of the continents, with the exception of Australia, it is the most densely populated. Its area would go three times into Africa, and four times into the Americas or Asia. It has a total population of about 447,000,000—more than half as much as Asia, and more than twice that of the Americas. For every square mile of its area there are 146 people, against 63 for Asia, 19 for North America and 11 for South America.

Comparatively few wild animals still remain in Europe. Reindeer and polar bears roam parts of the far north, and the last remaining European bison are preserved in the national parks of Poland. Some of the wilder forest regions are infested by wild boars, bears and wolves. The lynx is common in Sweden and



**THE LAST OF THE EUROPEAN BISON**

At one time almost extinct, the European bison is now a carefully-preserved creature, being gradually bred up in the national parks of Poland. It is smaller and less dignified than the famous American bison, but it is peculiarly interesting because it is the largest wild creature found in the continent of Europe.

*Courtesy of Polish Legation*

**Norway** The chamois still wanders over the Alps, the Pyrenees and the Carpathians. Deer and other game preserves are numerous.

A large part of Europe was once covered with forests. Ages of reckless destruction exhausted the timber over many thousands of square miles, and thus so seriously affected climate and

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irrigation that the leading governments now replant and look after forests systematically

Europe falls into three main climatic divisions (1) the Mediterranean region, where the summers are dry and hot and the winters mild and rainy, (2) the east, where most of the rainfall comes in the summer and where the differences between summer and winter are great, and (3) the

west, where the rainfall is distributed throughout the year and the changes in temperature are only comparatively slight

The continent is the chief industrial centre of the world. No other continent has so many people engaged in manufacture. It contains the largest city in the world, London, and also the smallest independent country, Monaco

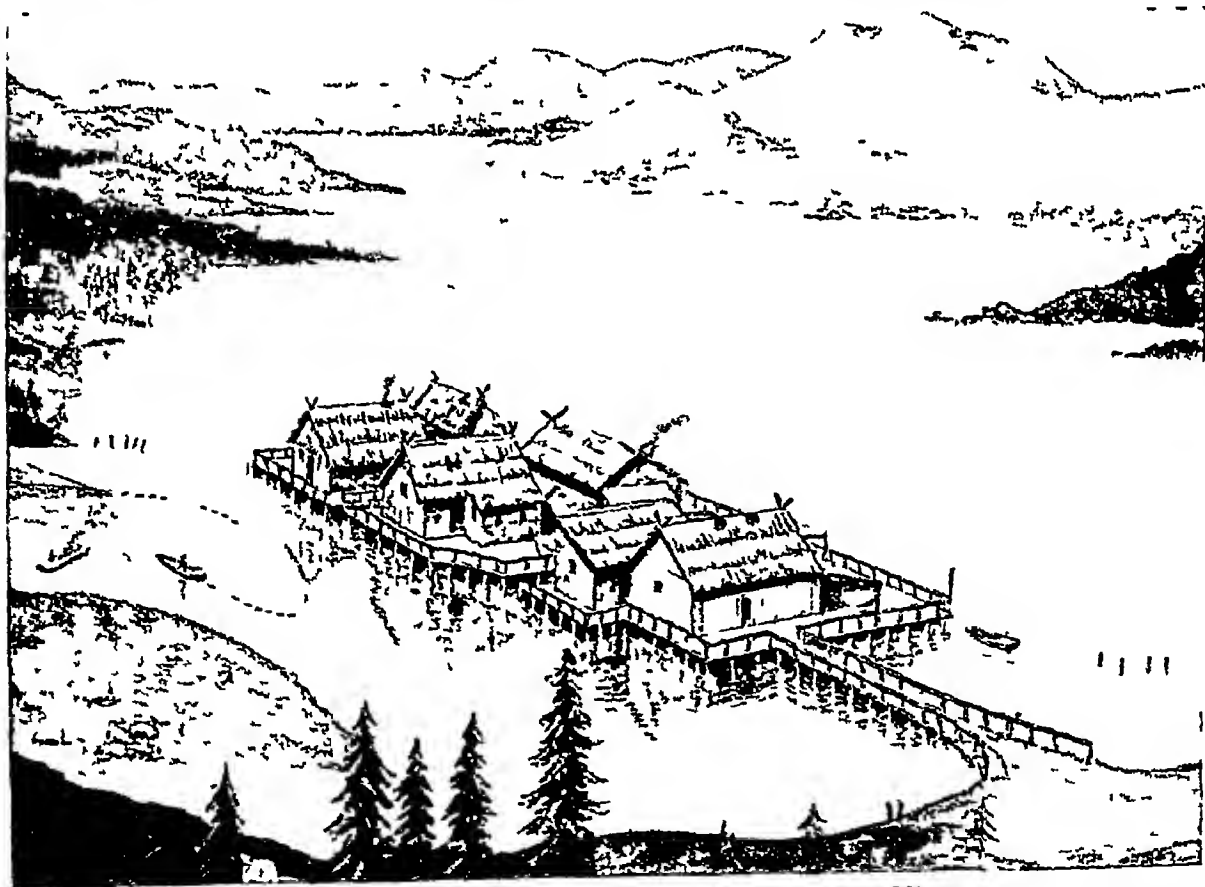
## The DRAMA of EUROPE'S HISTORY

*For thousands of years Europe has been the scene of great events—peoples on the march, great battles, rise and fall of principalities and powers. Small wonder, then, that its historians have an interesting tale to tell*

**European History.** Twenty five thousand years ago, at the close of the last Ice-Age, or glacial epoch, primitive Man had already marked Europe for his own. From the caves of France, Spain, Germany, and elsewhere, from wooden villages set on piles driven fast into lake or river-bottoms, from southern Sweden and Switzerland to the heel of Italy and the Black Sea—the smoke of his camp-fires floated over the forests. Slowly and painfully he rose from savagery to barbarism.

More advanced civilization began, about 2500 B.C., to come from Egypt and Asia by way of the islands of the Aegean Sea. In course of time this flowered into the splendours of Greek and Roman culture. With these two peoples there begins the recorded history of Europe, as opposed to our dim glimpses into its prehistoric past. (See Aegean Civilization, Cave Dwellers, Ice Age, Stone Age)

On the death of Theodosius the Great (A.D. 395) the Roman Empire was divided finally



LAKE-DWELLINGS IN PREHISTORIC EUROPE

Thousands of years ago, during the New Stone and Bronze Ages, a broad-headed people came to western Europe and developed a new way of living. Some of them built villages on piles over shallow lakes and marshes connected with the land by wooden causeways, and from these strangely situated homes they paddled ashore in 'dug-out' canoes (you can see two of them on the left of this drawing). Such lake-dwellings are still found in the Admiralty Islands in the Pacific, their causeways can be removed like drawbridges to secure them from an attacking enemy.

Drawing after Prof. J. M. Tyler "New Stone Age" (Scriveners)



'THE GOTHs ARE HERE!'—ROME TAKEN BY THE BARBARIANS

Terror swept throughout Rome when the Visigoths (the word means Western Goths) captured and sacked the capital of the decaying Roman Empire in A D 410. Three centuries before, they had wandered from their home beside the Baltic Sea, and, plundered their way through Southern Europe until the Romans allowed them to settle in the north-east of Italy. Then they rebelled against Rome under Alaric's leadership—and above you see Rome about to pay the price for failing to control one of the many peoples she had conquered.

into two parts—the Western Empire with Rome as its capital, and the Eastern Empire (also called the Greek, or Byzantine, Empire), the capital of which was then Constantinople (See Byzantine Empire). Beyond the boundaries of the Roman world were numerous barbaric peoples, divided into three main groups: (1) remnants of the great Celtic stock in outlying parts of the British Isles, (2) Germans or Teutonic folk lying along the Rhine and Danube and in the Scandinavian peninsula, and (3) the great mass of the Slavs, ancestors of our modern Poles, Russians, Czechs, Serbians, and others, whose tribes even at that time lay eastward of the Teutons.

The German barbarians were divided chiefly into Goths, Burgundians, Vandals, Alamannians, Bavarians, Langobards (Lombards), Franks, Angles, Saxons, Frisians, etc. The Gothic tribes (Visigoths and Ostrogoths) for nearly 200 years had been established along the shores of the lower Danube and the Black Sea. This region was invaded by the Huns from Central Asia and its inhabitants pushed westward, causing the great Gothic invasion (A D 375).

Gaul was overrun chiefly by Visigoths, Burgundians, and Franks, Spain by Vandals, Suevi, and Visigoths, Africa by Vandals crossing from Spain. Italy suffered a number of invasions, especially those of the Visigoths,

Ostrogoths, and Lombards. Britain, after being abandoned by its Roman garrison (A D 410), became a prey to Angles and Saxons sailing in their piratical vessels from their homes about the mouth of the river Elbe. But the influence of Rome—its language, law and government—has never yet been wholly effaced.

It was the task of Charlemagne (742–814), building on the foundations laid by the Frankish kings who preceded him, to consolidate the Germanic conquests into an empire which stretched from the river Ebro in Spain to beyond the Elbe, and from the North Sea to a little south of Rome. The decline of classical civilization was checked, something of the Roman tradition of unity, order and centralization was preserved in the face of advancing feudalism, and Christianity was spread through most of Western Europe (See Charlemagne). But Mahomedanism, established in Spain since 711, lingered until the Moors were conquered in 1492.

The division of the Frankish empire in the Partition of Verdun (843) became the starting-point of the kingdoms and nations of France and Germany. Under Otto I, German king from 936 to 973, the empire in the West was a second time revived, in 962, under the title of the 'Holy Roman Empire.' But it now included only Germany and Italy, and its power grew ever less until its extinction in 1806.



#### WHEN THE THIRTY YEARS' WAR ENDED AT MUNSTER

It took five years to settle the terms of the treaty that ended the Thirty Years' War, and during the preliminary talks the slaughter still continued. But on October 24, 1648, peace between Spain and the Netherlands was finally concluded at Munster, Westphalia. Above you see the historic meeting in the "peace chamber" of the town hall. This picture by Gerard Ter Borch shows the Spanish ambassador taking the oath, his hand upon the Bible, whereon lies a crucifix. The Netherlands minister stands beside him, and to the left of the table is the commandant of Munster.

National Gallery London

The Eastern Empire, in spite of many vicissitudes, fulfilled its function as a bulwark against Asiatic conquest and Mahomedanism until it was overwhelmed by the Ottoman Turks (fall of Constantinople, 1453). Where Hungary now is dwelt the Asiatic Avars, whose place was taken in the 10th century by their kindred the modern Magyars. Nothing but the little kingdom of Asturias was left of the Gothic power in Spain, but from this seed grew the Christian realms of Castile, Leon, and Aragon, which were consolidated in the 15th century into the kingdom of "their Catholic Majesties," the sovereigns of Spain, until 1516, when King Alphonso XIII fled the land of his fathers.

#### Conquests of the Northmen

The viking Northmen, after raiding from their Scandinavian homes the coasts of all western Europe in the 9th century, settled in western France in 911, then as "Normans" they founded the kingdom of Naples and Sicily in Italy, and gave a new dynasty to England (1066). Their descendant on the female side, Henry II of Anjou, was king of England, lord of Ireland, and feudal holder of Normandy, Anjou, Brittany, and Aquitaine in France. Only gradually were the Capetian kings of France able to restore the unity of their kingdom and set it on that path which made it under Louis XI, 1461 to

1483, the first strong monarchical state of modern times.

Meanwhile the "States of the Church" were established in Italy as the temporal dominion of the Pope. Poland and Russia became settled Christian states, the heathen Prussians were Christianized and Germanized by the Order of Teutonic Knights, feudalism, Christianity, monasticism, and medieval art and learning spread everywhere, and the Crusades, the growth of town life, and the reviving commerce prepared the way for that rebirth of the human spirit which we call the Renaissance.

The expedition of Charles VIII of France, in 1494, to assert his claim to inherit the kingdom of Naples and Sicily, started a series of wars over Italy which embroiled France and Spain for half a century and enabled the Reformation started by Luther to get such a hold that it could not be stamped out. The close of the conflict left the Emperor Charles V ruler not only of united Spain and Germany, but also of Sardinia, Sicily and Naples, Milan, the Netherlands, the county of Burgundy (Franche Comte), and a great part of the New World. His brother, Ferdinand I, Archduke of Austria and emperor, and head of the German branch of the Hapsburgs after Charles, obtained by marriage Silesia, Bohemia, and that part of Hungary which had not fallen

## EUROPEAN HISTORY

into the hands of the victorious Turks. The power of the Spanish Hapsburgs, under Charles's son, Philip II, and his successors, declined.

The close of the Thirty Years' War (1618-1648)—the last of the wars of religion—left the Holy Roman Empire greatly weakened and practically confined to Germany and Austria. France became again the first power of Europe, having obtained much of the Burgundian lands (including Franche Comté) conquered by Louis XIV. Savoy, straddling the French Alps, was becoming an Italian power. Spain still held the Spanish Netherlands and a great part of Italy.

The Protestant Netherlands (Holland) and Switzerland had freed themselves by successful revolt from the Empire. Sweden, independent of Denmark since 1523, was one of the great powers, having conquered territories alike from Germany, Poland, and Russia. Denmark still ruled Norway. The Duchy of Prussia, united to the Mark of Brandenburg in 1618, was soon (1701) to give its name to a new German kingdom erected by the Hohenzollerns.

In the 16th century Poland (in union with Lithuania since 1569) was one of the most powerful states of Europe, stretching from the Baltic almost to the Black Sea, but the 18th century saw its steady decline. Russia, under Peter the Great (1672-1725) and Catherine II (1729-1796), became a formidable and disquieting power. Turkey, though reduced since its high-water mark of conquest in the 17th century, still retained the greater part of the former Eastern

Empire. Venice held extensive sway in the Adriatic and the Eastern Mediterranean, and Genoa held Corsica until it passed to France in 1768.

Soon after the outbreak of the French Revolution (1789) Poland ceased to exist, through partition by her greedy neighbours. Prussia had risen to the rank of a great power following the wars of Frederick the Great. Sweden had lost the leadership of northern Europe. The Spanish Netherlands had passed to Austria in 1713, and branches of the French house of Bourbon ruled the parts of Italy that had been Spanish, as well as Spain herself.

### England's Place in the 19th Century

England had become the head of a British Empire, and had originated the inventions which led to the Industrial Revolution, a change quite as important in its way as the French Revolution. As "the Mother of Parliaments" she was the model to the world during the first half of the 19th century.

The wars of the French Revolution (*see* French Revolution) began a series of changes that ended in the extension of Napoleon's direct empire over Germany west of the Rhine, the Netherlands, north western Germany, and a great part of Italy and Dalmatia. In addition, Spain was ruled by his brother Joseph, Naples by his brother-in-law Murat, and the Grand Duchy of Warsaw and the Confederation of the Rhine by his nominees.

After the fall of Napoleon at Waterloo the Congress of Vienna forced France to retire within



REVISING THE MAP THE VIENNA CONGRESS OF 1815

These statesmen from all the Powers of Europe have good reason for looking so serious, they have just heard of the astonishing return of Napoleon from exile on the isle of Elba, which means that their efforts to make lasting peace in Europe after Napoleon's wars will be spoilt. Not that these diplomats spent all their time thus, however, for gay Vienna was at its gayest just at this period, and the new waltz was all the rage, although you would not think so from this lithograph (by Dorndorf after J. B. Isabey's picture).



her old limits, and in large part restored the old government. But Russia was allowed to annex Finland from Sweden and increase her Polish territories by absorbing the Grand Duchy of Warsaw. Prussia was enlarged at the expense of Saxony, and by annexations on the west bank of the Rhine. Austria was given northern Italy in exchange for Belgium, which was united with Holland until 1830. Norway was torn from Denmark and given to Sweden, with which it remained united until 1905.

The states of Germany (now reduced from several hundred to 39, including Austria and Prussia) were organized into a loose union called the German Confederation, to take the place of the Holy Roman Empire which had now disappeared. A fantastic "Christian brotherhood" of sovereigns was formed by the Tsar Alexander I of Russia, called the "Holy Alliance." But the real power, which, under the lead of the Austrian statesman Metternich, through a series of European congresses, preserved peace and bolstered up absolute power for thirty years, was the "Grand Alliance" of states which had overthrown Napoleon.

The revolutions of 1830 and 1848, whose waves spread from France over a large part of Europe, showed, however, that democracy and liberalism on the continent were not yet dead. A series of wars and diplomatic incidents covering nearly a century reduced the Turkish power to a bare foothold in Europe and freed the Christian Balkan states.

In the second half of the 19th century the chief events were the freeing of Italy from Austrian rule and its union into a kingdom under the house of Savoy, the uniting of the German states by Bismarck into the German Empire under the hereditary rule of the king of Prussia, Germany's annexation of Alsace Lorraine from France after the Franco-Prussian War, and the reorganization of Austria into the Austro-Hungarian monarchy.

#### Great Powers in Rival Camps

France never ceased to resent her humiliation and the loss of Alsace Lorraine in the Franco-Prussian War, and Bismarck, fearing French revenge, united Austria and Italy with Germany in the defensive Triple Alliance. For more than two decades France was isolated diplomatically, but after Bismarck's dismissal from office in 1890 France succeeded in creating the Triple Entente—France, Russia, and Great Britain—as a counterbalance to the Triple Alliance. This action was based on the old theory of "balance of power"—that power in Europe should be so distributed that no one nation or group of nations should be able to dominate the others.

Both sets of powers steadily increased their military forces until Europe became an armed camp. Two peace conferences held at The Hague

in 1899 and 1907 failed to limit national armaments, and entangling alliances and great national armaments engendered international fear, suspicion, and unrest.

In 1912 and 1913 two Balkan wars gave rise to a clash of interest and ambition among the great powers of Europe, and resulted in territorial changes in the Balkans unfavourable to the Hapsburg empire. After 1913 the latter was especially desirous of crushing Serbia, which, doubled in size by the Balkan wars, was carrying on a vigorous Pan-Serbian propaganda in Bosnia and Herzegovina, where many Serbs lived. The assassination of Francis Ferdinand, Austrian crown prince, in the Bosnian capital of Sarajevo (June 28, 1914) was the result of Serbian propaganda. Austria's determination to crush the little Serbian state finally brought the system of entangling alliances into operation and engulfed all Europe in the World War (*see* World War).

#### After the World War

The changes which occurred in Europe as a direct consequence of the World War were profound and sweeping. Long established national boundaries were obliterated, widely accepted political institutions were overturned, new and perplexing economic systems were introduced, the ranks of the social classes in many cases were transformed, and the course of international relations was profoundly altered.

Probably the most obvious changes which occurred were changes in Europe's political geography. As a consequence of the nationalist upheaval which accompanied the war, the Dual Monarchy (Austria-Hungary) fell into fragments. Part of the former Hapsburg realm established itself as the republic of Czechoslovakia, a new state in central Europe. Part united with Serbia and Montenegro to form the new Balkan state, Yugoslavia. Part joined with districts of Germany and Russia to re-establish the Polish state which had been partitioned by the Romanoffs, the Hapsburgs, and the Hohenzollerns at the close of the 18th century. Part entered the Rumanian kingdom, where dwelt people of a similar race. Part was redeemed by Italy and added to the Italian kingdom as the final step in its national unification. Only the Austrian Republic and the Hungarian kingdom remained as little reminders of the Hapsburg empire.

Although Russia did not, like Austria-Hungary, disappear from the map of Europe, it was considerably altered territorially. Practically all the region along the Baltic was torn away by nationalist uprisings of submerged peoples. Finland, Estonia, Latvia, Lithuania, and Poland appeared as new states in this part of Europe, and with the exception of Poland they were carved entirely from the former Russian Empire. Bessarabia became part of Rumania. In western Europe France, Belgium, and Denmark were



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slightly enlarged at the expense of Germany, and in the Balkans, Greece and Yugoslavia received territory taken from Bulgaria. Most of the changes were made on the principle of nationalism, so that the continent after the war was more nearly organized into national states than ever before in history.

At the same time, Europe's general acceptance of monarchy as the desired form of government was rudely shaken by the overthrow of the Hapsburg, Hohenzollern, Romanoff, and Ottoman dynasties, and later by the fall of the Bourbons in Spain. The post War period was thus marked by a pronounced tendency toward the

break down in a number of states. In these, régimes known as "dictatorships" were established. The best-known examples were the Communist dictatorship in Russia, the Fascist dictatorship in Italy, and the Nazi government which replaced that of the German republic. Monarchism, too, made a gain when King George II of Greece was restored in 1935!

The World War did not affect Europe in its political life alone, it brought also economic burdens and problems of the most serious nature. In all European countries the burden of taxes for interest on public debts weighed much more heavily than before the War. This burden was



RUSSIA REJOICES IN THE FALL OF TSARDOM

In the Nevsky Prospekt of Petrograd (formerly St. Petersburg and now called Leningrad) such demonstrations of triumph as this were seen almost every day after the revolution in March, 1917. It was in October of that year that the Bolsheviks finally gained supreme power in Russia, but at the time when this photo was taken only the army had actually revolted, and, as you see the people soon followed their example by carrying revolutionary banners round the city.

republican form of government. Most of the newly-created states established that type of government, so that after the World War by far the majority of the people of Europe lived under republics. In the extension of popular government, moreover, women were no longer ignored. Whereas, before the War, Finland, Norway, and Denmark were the only countries which had extended the national franchise to women in the years following the War twenty states—including Great Britain, Germany, Russia and Spain—conferred the vote upon women.

Nevertheless, although the reconstruction of Europe brought a great advance towards democracy, parliamentary government soon began to

further increased by the expense of replacing property destroyed by the War, especially in countries that had suffered invasion.

Financial "crashes" resulting from inflation of currencies ruined many members of the wealthy and middle classes. At the same time, a great wave of land reform spread across Europe, and in many countries the estates of wealthy landowners were divided among the peasants. Everywhere the condition of the working classes improved. With the growth in power of the popular parties, especially in France and Spain, strikes for higher wages and better working conditions sometimes had government favour and even support.

The economic situation was rendered still more serious because during the War European countries had lost their hold on world markets. Later the demonetization of silver in India and China ruined the rich markets which yet remained in those countries. An increasing trend toward national self-sufficiency further cut down international trade, and high protective tariffs formed barriers to the free flow of goods. Lessened trade was accompanied by a world wide business depression which threw millions out of employment. Beginning in 1929, the inevitable

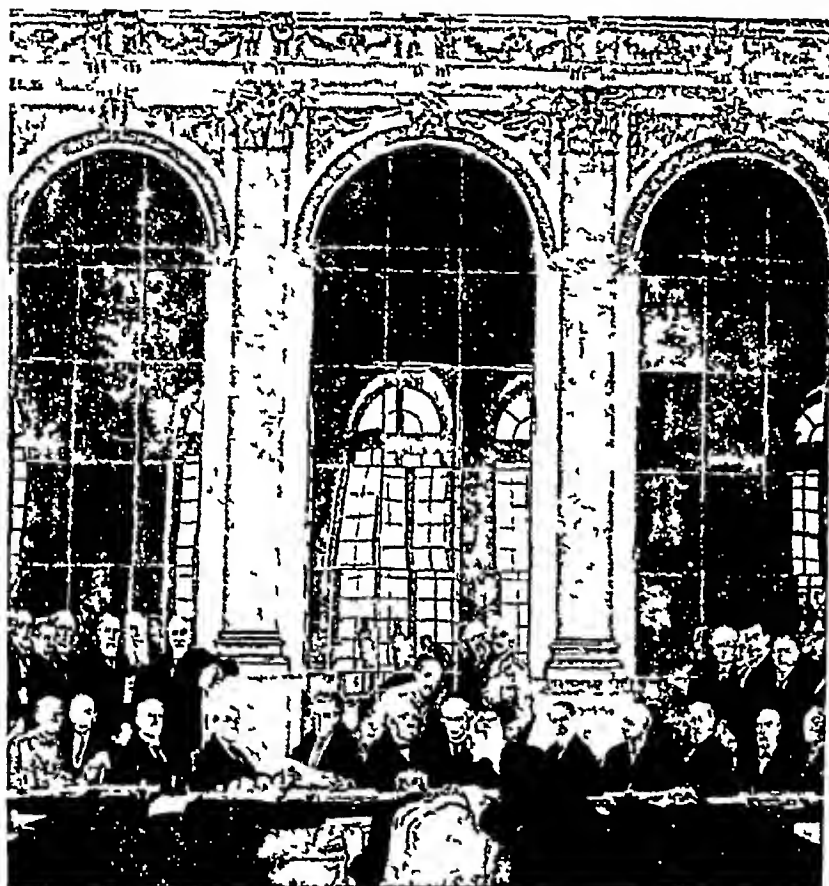
any efforts to have the Versailles Treaty revised. Germany, after an attempt to live up to the hard terms of the treaty, drifted into the Nazi philosophy of militarism and nationalism, with its immediate aim to re-establish Germany's prestige. Under the leadership of Adolf Hitler it proceeded, in 1935, to re-fortify its borders, increase its army, rebuild its navy, and develop a great air force. All these steps were in violation of the terms of the peace treaty and in defiance of the authority of the League of Nations. As a result there started in other countries

a race for rearmament and demands for new alliances and agreements. Italy's successful defiance of both protest and sanctions in its conquest of Ethiopia in 1936 still further weakened the prestige of the League. Profiting by the unsettled state of affairs and by the general apprehension, Germany suddenly remilitarized the Rhineland.

By the summer of 1936 the issues born of the old World War treaties were growing dimmer, and new issues were arising to divide not only nations but the people within nations. Nearly every country had its pro-Fascist party, which looked to Italy and Germany for its models of political action, and its pro-Communist party, which looked in the same way toward Russia. The outbreak of revolution in Spain, where Spanish army leaders and Fascists rebelled against the Radical Socialist government, dramatized this issue. Mussolini and Hitler openly sympathized with the insurgents, while Russia and the Socialist government of France supported the established government.

With every statesman's eye turned in sympathy and fear on the progress of that struggle, Europe was again in a condition where a small incident might let loose another general war. All the time, careful and secret preparations were being made by the Nazi Government to re-open the conflict. The crises of 1938 and March, 1939, in due course led to the Second Great War.

**Evaporation.** A small illustration of one of the biggest things in the world takes place when clothes dry on washing day. Evaporation makes the world fit to live in. It is the means by which water is drawn from the great



**SIGNING THE VERSAILLES TREATY**

Modern Europe is largely the creation of the Treaty of Versailles, of which this picture, painted by Sir William Orpen, shows the signing, on June 28, 1919, in the Hall of Mirrors of the Palace of Versailles. In the centre Dr. Johannes Bell is appending his signature for Germany. Above him is Mr. Lloyd George, on whose right are M. Clemenceau, the French premier, and President Wilson. On Mr. Lloyd George's left are Mr. Bonar Law, Mr. (afterwards Earl) Balfour, and Lord Milner.

*Imperial War Museum*

financial crisis struck Europe. Great Britain was forced off the gold standard in 1931, and most other countries followed that example.

At the close of the World War new instruments for international co-operation were set up—the League of Nations and the World Court. Other guarantees of peace and security included the Locarno treaties (1925), and the Kellogg-Briand Peace Pact (1928).

But the sores left by the World War did not heal. France, always suspicious of Germany, allied herself with Poland and the Little Entente (Czechoslovakia, Rumania, Yugoslavia) to block

ocean reservoir and from minor sources of moisture, to give the air its necessary humidity, to lessen the changes of temperature between day and night and between winter and summer, and to create the clouds that in their season give snow and rain to help to raise crops and feed watercourses

The air at any given temperature has a certain definite capacity for holding water vapour, somewhat as a sponge holds liquid water, and, like a sponge, the air takes water vapour from any exposed moist surface, rapidly if it is very dry, and more slowly if moist. In desert regions rain may be seen to fall from the clouds, though not a drop reaches the ground. This is because the hot dry air drinks it up, or evaporates it.

Desert plants protect themselves against the dry air by exposing as little surface as possible for evaporation. The cactus, for instance, presents a surface of dry spines and thick leathery lobes within which it seals up all the moisture it can gather. For the same reason some species of eucalyptus trees turn their large leaves edgewise to the sun. In more humid climates plants spread out vast evaporating surfaces. The leaves of a single tree may give off many gallons of water in a single day, in the form of water vapour.

The capacity of the air for water vapour increases as the temperature rises, and the

amount of water actually present in the air at a given temperature, divided by the amount of moisture it is capable of holding at that temperature, is called the *relative humidity*.

A very dry atmosphere parches the skin and mucous membranes, but if the air is very moist, as on some sweltering summer days, it does not evaporate perspiration rapidly enough to prevent a hot, "sticky," uncomfortable feeling.

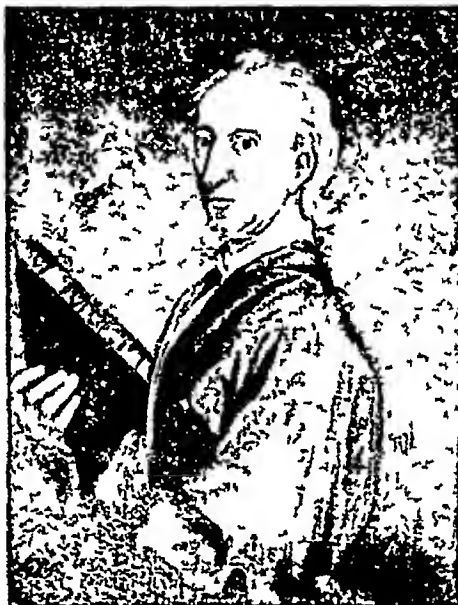
#### Evaporation's Cooling Effect

One of the most important effects of evaporation is to lower the temperature. You are cooler on a hot day if you perspire freely, because the evaporation of the perspiration cools your skin. You are cooler in a breeze than in still air because a breeze assists evaporation by continually bringing new air along. On farms, where there is no ice in summer, perishable foods are kept sweet by wrapping the container in a wet cloth which is dipped into a pan of

water. In Mexico and India drinking water is often cooled in large porous jars kept exposed to the wind.

The rapid evaporation of many highly volatile liquids produces intense cold, where the evaporation of water merely chills. The evaporation of ammonia is used in making ice, and the numbing cold caused by the rapid evaporation of ether is used to produce local anaesthesia or loss of the sense of feeling.

**John Evelyn.** (1620–1706) The descriptions of "country gentleman" and "man of letters" aptly suit John Evelyn. Although a very minor figure in English literature, and



JOHN EVELYN

An entry in Evelyn's famous diary enables us to date this portrait of him 'July 8, 1679. Sat to Mr. Kneller for Mr. Pepys, holding my *Sylva* in my hand.' Connoisseur of the arts, Evelyn was also a famous designer of gardens.

Royal Society

probably unknown to most people, Evelyn possessed exactly the mental width and impartiality connoted by the latter, and the calm, pious, and perhaps supercilious temperament implied by the former designation. With the exception of his *Diary*, which is infinitely less famous and popular than that of his contemporary and friend, Pepys, his works are largely forgotten, yet in a variety of little books and essays he shows himself at least as pleasant a character as Izaak Walton, whose interest in, and love of Nature, he shared. But whereas Walton was obviously a lover of the open spaces, Evelyn possessed a mind which took its greatest pleasure within the limits of a walled garden, he became, indeed, the most famous

designer of gardens of his age.

John Evelyn was born at Wotton, Surrey, on October 31, 1620. Though loyal to the king and an ardent churchman, he did not take up arms in the Civil War, but divided his time between Wotton, where he beautified the existing gardens and designed new ones, and the Continent, where he travelled widely, taking particular interest in the scenery. In 1652 he purchased Sayes Court, Deptford, where, again, he proved a brilliant horticulturist, his gardens there and at Wotton becoming quite famous.

Ugliness or destruction of any kind was anathema to Evelyn, and one of his most interesting works was his "*Fumifugum*," a protest against the damage wrought by coal-smoke in London, and a plea for beautifying the suburbs with flower beds. But his best-known publication was his "*Sylva*," a beautifully written discourse on forest trees.

His "Pomona" concerns fruit-trees and their relation to cider, while among Evelyn's other works on Nature are his "Kalendarium Hortense," "A Philosophical Discourse on Earth" and "Terra." These works, and especially "Sylva," which is an excellent example of beautiful prose at its best, deserve to be more widely known. Evelyn died at Wotton on February 27, 1706.

**Everest, MOUNT.** No one has yet climbed to the summit of Mount Everest, the King of the Himalayas, although the British expedition of 1924 nearly did so, Mallory and Irvine being lost on a last heroic attempt. British airmen flew over the summit in 1933, but land "assaults" then and in 1936 were unlucky.

These expeditions are led by experienced and courageous climbers with a large party of native carriers to help carry the extensive equipment necessary. Long preparations must be carried out, and the approach from Darjeeling up the East Rongbuk glacier, followed by the final assault, must be carefully timed. The high est point (approx 28,000 feet) reached by anyone who has survived was attained by E. F. Norton in 1924 and F. S. Smythe in 1933. The people of Tibet, and of Nepal, where Everest is situated, regard the mountain with superstitious awe.

Everest is about  $5\frac{1}{2}$  miles (or 29,002 feet) high, and was named in honour of Sir George Everest (1790-1868), the English official who first fixed its position and altitude. (See Himalaya Mountains)

**Evergreen.** A tree or plant which retains its foliage throughout the year, such as the pine, fir, hemlock, laurel, etc., is an evergreen. Evergreens are in contrast with deciduous plants which shed their leaves periodically, generally at the onset of winter.

The term evergreen is often taken to mean any tree with cones and needles—in other words a conifer—as opposed to a broad leaved tree. But not all conifers are evergreens, for example, the larch is clothed with needles and cones, but sheds its foliage in the autumn. On the other hand, a large proportion of broad leaved tropical or semi tropical trees, such as the laurel, are evergreen. (See Tree)

**Everyman.** The most famous of all morality plays, "Everyman," which is still frequently performed in England and elsewhere, was originally produced here about 1530. Like most true "moralities," it deals with the endless struggle in Man's life between the forces of good and evil. Modernized, this play has been very widely produced, being made especially suitable for large scale open air spectacular productions. The best known of these is that of the famous German producer, Max Reinhardt, which has been performed for some years at Salzburg. Of all the old "moralities," "Everyman" alone has captured the imagination and held the attention of the modern world, and there is seldom a time when it is not being produced somewhere or other.

## LIFE'S UNFOLDING in EVOLUTION

*Of all the theories put forward by scientists, that of Evolution has had the most far-reaching effects, and nowadays no person with any pretensions to being educated can afford to be without some knowledge of it*

**Evolution.** Probably one of the first questions that men ever asked themselves was the whence, the why and the wherefore of living things. It is a question the inquiring mind of childhood still asks. And it is a question not yet finally answered.



Fossilized Sea Lily

Even in the remote past Man made much progress both in taming animals and cultivating plants for use or for pleasure as companions and ornaments. And as a result these things became much changed from the wild forms from which they had originated. It is not too much to suppose that the minds of our remote ancestors often wondered if Nature had not also performed many

similar experiments in changing the forms and functions of plants and animals.

The earliest records of attempts to explain the changes of living things from one form into others were those of the ancient Greeks. Aristotle, the great philosopher of the 4th century B.C., believed that the higher forms of life were derived from the lower. But such views were crippled, as viewed from our modern standpoint, by the general belief of those times that even higher forms (such as frogs) might arise from non living matter. This belief was referred to as the theory of spontaneous generation.

There have been many popular errors regarding the modern doctrine of evolution. One is that Charles Darwin was the "father of evolution," meaning, in this sense, the founder of evolution. But while we properly think of him as the greatest teacher of this doctrine in modern times, it should be realised that there had been a number of very able exponents of evolution before the publication of Darwin's "Origin of

## EVOLUTION

Species" in 1859, of whom Lamarck (1744-1829) in France was the most notable

Another mistake is that Darwinism (Darwin's theory) and evolution in general are the same, which is far from true. For, as we shall see later, while thinking people generally have accepted the general principles of evolution, they are divided as to how evolution has taken place. Darwinism is only one explanation. The whole matter of evolution is extremely complex, and it is only natural that Darwin's explanations should be less unreservedly accepted now than they were fifty years ago.

At the same time it would be wrong to assume that evolution has fewer followers today than formerly. Darwin's particular explanation continues to undergo modifications in the light of newer research, but the subject of evolution remains a vital study of scientists.

Nor should we expect to see evolution taking place as an everyday occurrence. Man has worked wonders in changing wild animals into domestic forms, and wild plants into the many garden varieties, but this has taken thousands of years, and evolution in general has taken many millions of years. These last fifty years during which experiments may have been made are as but a second compared with the time during which life has existed.

Throughout these millions of years life in all its many forms has been struggling upwards, higher and higher in degree and complexity, till we have now the many kinds of living things that inhabit the earth.

A vast number of illustrations can be cited from the mass of evidence that science has gathered, to show why belief in the doctrine of evolution is justified. One of the most important is to be found in palaeontology.

Palaeontology—the science of the fossils found in the rocks of the earth—gives us two types of evidence. First, that the early rocks contain fossils of the lower forms of life in great variety and abundance, but none of the higher. There were no backboneed animals (vertebrates) in the world at that time. They came millions of years later, the first being the primitive fishes. Later, through succeeding millions of years, amphibia (frogs and their kin) came, and then early reptiles and the early birds and mammals.

The early mammals gave rise to the many forms of hairy animals we are now familiar with, by a process of evolution extending through, perhaps, ten million years.

All along the line of evolution science shows that many forms of life have come into the world and vanished. This is especially striking in the case of reptiles. Through millions of years they were evolving. More than 20 orders of them were present at one time, during the millions of years called the "Age of Reptiles" when, as

the vast dinosaurs whose fossil remains we know, they ruled the earth (see Dinosaurs). Then, with the changing climate which encouraged the evolution of mammals, the reptiles grew fewer, till now there remain but five different orders.

The study of fossils also shows, in many cases, the certain evolution of some types. This is especially clear in the case of the horse—in which each foot retains only the middle finger or toe, with its nail greatly enlarged to form the hoof.



### THE FIRST HORSE

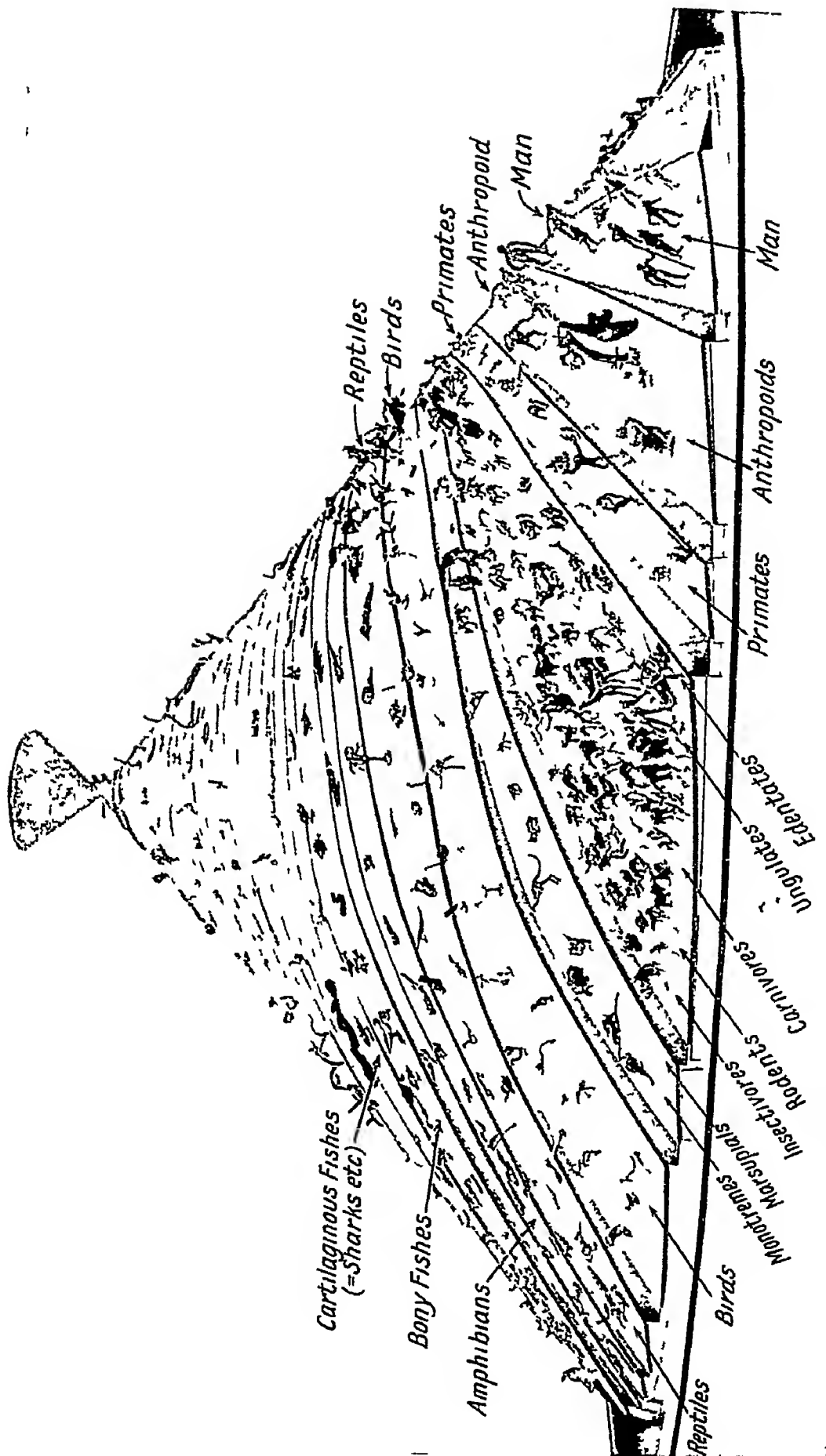
This little creature reconstructed from a skeleton, lived millions of years ago. As you see from the skull above, he was the ancestor of the large modern horse, but instead of hoofs, he had toes and heels. Scientists call him "Eohippus," meaning 'dawn horse'.

American Museum of Natural History

We begin with horse like animals the size of foxes, which had all five fingers and toes on the feet. From these it is possible to trace a dozen stages, changing gradually through several millions of years, till the modern horse is developed.

Of course, the simplest forms of life did not leave fossils, for they had no hard parts to fossilize. Again, even among animals with hard parts, it is the rare individual dying a natural death under very special conditions that has a chance to form a perfect fossil. And of the ones saved as fossils, Man has found but a small proportion, for he can explore only a few specks, as it were, of the earth's crust. The





**HOW LIFE 'UNROLLS' THROUGH THE AGES THE CONE OF EVOLUTION**

This model, one of the most striking exhibits in the Palace of Discovery at the 1937 Paris Exhibition serves to illustrate the process by which Man and the living animals have developed through the ages from primitive organisms in slime and sea. The word "evolution" comes from the Latin for "unroll" and the arrangement of the creatures round the cone well suggests the process. Along the outer circle at the bottom you find all forms of life as they are today. Take a horizontal line further up the cone and you find life as it was a few million years ago. So we mount, until at the apex of the cone we have the creatures of the primeval swamps. Man is the highest kind of creature so far evolved, though the lower types which preceded him still exist, in their modern forms.

water-organisms fishes plants trees, birds, four-footed animals and apes

Photo by O. Doye



## EVOLUTION

horse, however, is sufficient to prove the general principle of evolution

The study of the comparative anatomy of animals also supplies much evidence for evolution. Just two or three examples, from the thousands that might be given. From low fishes to the highest animals, all vertebrates show the same plan of the brain, with nerves from the brain supplying the same parts of the head in all. Again, take the limbs of mammals or hairy animals. They are all built on the same plan. The bat's wing, or a whale's front flippers, for instance, have the same chief bones as the arm and hand of Man. Yet how different in outward appearance! And so case after case might be cited from the animal and plant kingdoms.

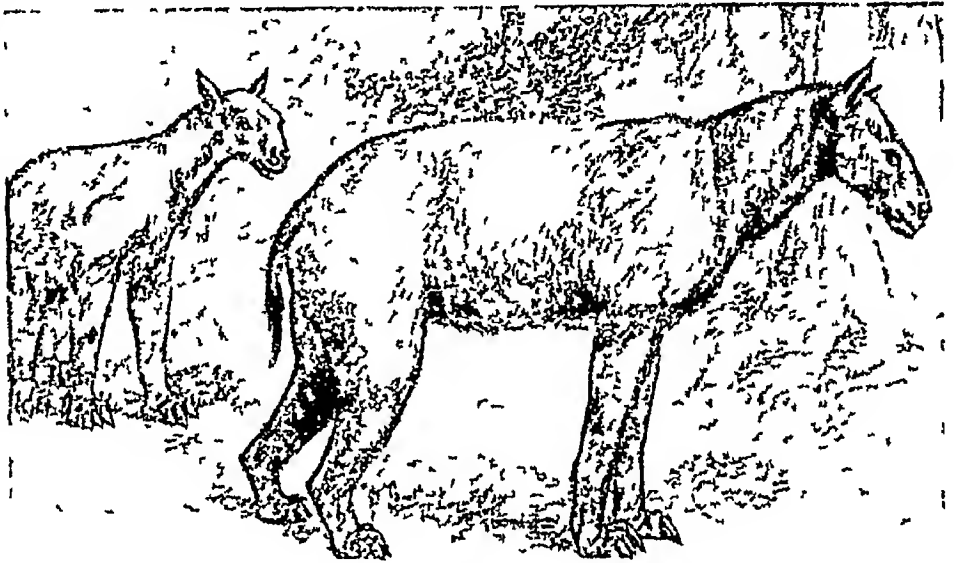
From embryology, or the development of animals and plants from egg cells, much evidence could be given. The principles are the same for all the common forms of life—for an insect as for a mammal. The highest forms of life tend to pass through the same stages in developing from the egg as they have in their evolution from the lower forms of life. (See Embryology)

Mammals in general have the same two sets of teeth as has Man. The whale bone whale has these two sets of teeth—only both sets are developed and lost before the little whale is born, and are never used at all. Again, the "vermiform appendix" in Man's digestive tract is a remnant of an organ that is useful in many other mammals. There are many such rudiments in Man's body, perhaps a hundred, inherited from the past when they once were useful.

The study of the physiology of different animals also shows many striking similarities. Take the higher animals, for instance. They all do the same things—breathe, sleep, and move about, use the same general class of foods, form the same kinds of wastes, and many other things. The most striking illustrations of these similarities are shown among the common higher animals, where scientists have made many discoveries of very great importance in medicine and surgery. We have all heard of "vitamins"—mysterious factors of several

kinds which are equally necessary to the health of Man and other higher forms of animal life. Most of our knowledge of these substances has been learned from experiments on other higher animals and then applying the results to Man.

Domestic animals and plants show how Man, by artificial selection or breeding, has very greatly changed—or "evolved"—many of our common forms of life. Among chickens, for instance, the variety is so great that, if the different kinds were found in Nature, they would easily be classed as different kinds of animals, for example, the great Brahmas, weighing 10 lb or more, and the tiny bantams, weighing but 1 lb. Yet all are derived from the same wild fowl of India.



### THIS HORSE HAD CLAWS!

Evolution produces the strangest varieties of one animal family. Here is the Moropus, another early relative of the horse. His skeletons, found mainly in Western Nebraska, are now in the museums of New York and Pittsburgh. He stood about six feet high, on very short feet, which had a big, strong middle claw for scraping food out of the ground.

*American Museum of Natural History reconstruction by Prof. W. B. Scott.*

Again, if we were to come upon various kinds of cabbage, kale, cauliflower and Brussels sprouts, we would say they were altogether different kinds of plants. Yet Man has derived them all from the same wild plant. (See Cabbage). These two examples are very striking, but a great many others from domestic varieties might be given.

The explanation as to how evolution of living things has taken place is a much more difficult matter. For, while biologists are all agreed that evolution has taken place, they are far from agreeing as to the processes involved. We may perhaps best begin with Darwin's explanation, and then trace briefly the changes in scientific opinion since his time.

First, we have to consider the materials with which evolution has had to work. These are the differences among the individuals of any kind

## EVOLUTION

of animal or plant. It is familiar to all that no two individuals are ever exactly alike. We notice the differences most clearly among people, because we examine people more critically than we do other animals. But the same principle holds for any kind of animal or plant.

### How 'Natural Selection' Works

Now, more young animals are born than can grow and reach the adult stage. In many species of animals and plants, thousands—even millions—come into the world from two parents. A toad, for instance, lays 20,000 eggs each year. But as soon as they are laid the losses begin. Some of the eggs perish or are destroyed, later, some of the tadpoles are killed and eaten by other animals, later still, the little toads perish, till at last only two perhaps, under normal conditions, are left to take the place of the two parents. That is where "natural selection" comes in to weed out the less good, and to preserve the ones best fitted for existence as toads. Only the best of every batch survive, when more than this survive, the population will obviously increase rapidly, and that is how "plagues" of creatures come about. Thus, the toad is kept perfectly suited to its own mode of life. If conditions change, toads adapting themselves most closely to the new conditions will survive, producing a race changed slightly from the old one, a new race, in fact, has evolved. Elsewhere, others of the original toads may have become adapted to other conditions, so that two new races are now evolved from the one original.

One of the great controversies of evolution has been about the causes of the differences among animals and plants of any species, and the way in which they affect the creatures concerned. According to Darwinism, the effective differences are usually small, and are caused largely fortuitously (without known causes), thus, an individual has some chance difference which makes it better suited to its life than its fellows. If this is inherited, its descendants will be more likely to survive.

### Modern Theories of Evolution

Let us now proceed to examine briefly two or three modern views. The "Lamarckians" believe in the "inheritance of acquired characters" in other words, they maintain that the difference among the individuals of any kind of plant or animal arises because the parent passes on what it has acquired during its lifetime to its offspring. As applied to Man, an athlete would have children stronger physically than his fellows, an educated man, children with better intellect, etc. Among the opponents of this theory are the followers of August Weismann (1834–1914), who point out that satisfactory proofs are not yet forthcoming. As a matter of experience, there is ample

## EXAMINATION

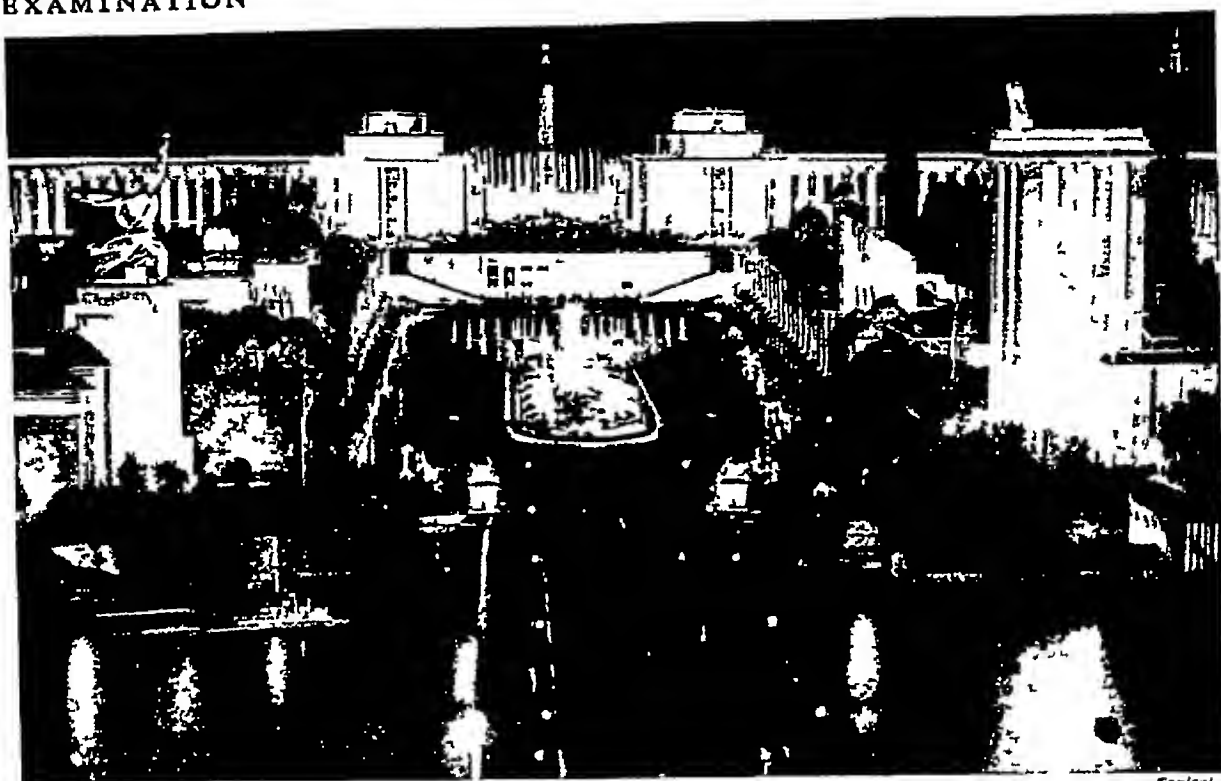
evidence against it. For instance, the feet of Chinese women are of normal size if allowed to grow, though Chinese women have bound their feet for hundreds of years.

The last really important theory is that of Hugo de Vries (born 1848), who has proved that Nature has taken advantage of the "sports," or "mutations"—that is, specimens remarkably different from their fellows—that from time to time are born or spring up in any species of animal or plant. Such a mutation is seen in a person with two joints in the fingers instead of the usual three, or with six fingers and toes instead of the usual five. Many of these mutations have been observed in both animals and plants, and it may be that they become the chief materials for the origin of new species. Obviously, if such mutations are favourable to the owner, enabling it to survive when its fellows are destroyed, or if they at least produce an equally efficient race, new species may come about. If they are antagonistic, the creature will fail and disappear in many cases.

There are still other theories as to the causes of organic evolution, but the ones here given show some of the points in dispute. It must be repeated, however, that, while there are differences of opinion as to the *method* of evolution, the *fact* of evolution is believed by scientists more firmly than ever before.

**Examination.** In China, certain tests of knowledge have been required of applicants for a Civil Service post since the 3rd century B.C., and to China probably belongs the honour of having invented this—and many another—form of torture. In those days, as often in our times also, the knowledge which was tested had no connexion with the knowledge which would be required in a successful candidate, the same fault can be found in the university examinations of the Middle Ages, which were mere "disputations," with students arguing small points of logic in the presence of the examiners. This method survives in the modern "viva voce," and it was not until the 18th century that examiners really began to ask questions. A century later examinations were made compulsory for entrance into the British Civil Service—over 2,000 years after the Chinese had invented them!

In modern times entry into any of the professions is hedged about by examinations, and education has only too often degenerated into the mere "cramming" of facts into a student to enable him to pass them. But since the World War attempts have been made to substitute tests of intelligence for tests of acquired knowledge, that is, to test a student's *capability* for knowing and doing rather than what he does know at a given moment. Attempts have even been made to abolish examinations.



Topical

### FLOODLIT BEAUTY OF THE PARIS EXHIBITION

Over 40 nations in peaceful rivalry co-operated to make the 1937 Exhibition of "art and craftsmanship in modern life" the greatest Paris has ever known. It comprised 280 pavilions and palaces, and in the above photograph of the fairyland mirrored in the smooth river Seine, you see the Russian pavilion on the left, the German pavilion on the right, and the main entrance to the exhibition (on the site of the old Trocadero) behind the fountains in the centre

altogether, and to accept in their stead a report by the teacher on his pupil's abilities. On the other hand, some form of examination will doubtless always remain, for it does test a student's ability to express himself clearly on paper and to acquit himself well in unfamiliar surroundings and at a critical moment.

**Exeter.** The county town of Devonshire stands on a ridge of land above the river Exe about 12 miles from the sea. A great part of the walls which surrounded it in the olden days still remain, though the four gateways have been destroyed.

The city possesses a comparatively small but very beautiful cathedral with Norman towers, which was begun in 1112. In its library is a MS collection of Anglo Saxon poems presented in the 11th century by Bishop Leofric. There are many other old buildings, including the Guildhall, built in 1330, with a pillared façade added in 1593, and the remains of Rougemont Castle, which, although Norman, was the site of Roman and British strongholds.

Exeter is an important railway centre, and is connected with the sea by a ship canal 5 miles long. It was formerly noted for its woollen goods, but agriculture, brewing, and lace paper manufacture are now active industries.

Exeter was captured six times between 876 and 1046, and was often besieged by the Danes

and others. The city surrendered to the Royalists in 1643, but three years later the Parliamentarians re-entered it. The present population of Exeter is about 66,000.

**Exhibition.** The word exhibition is now applied to a show or a display of any kind, from that in which an artist exhibits his own works in a small gallery to the great international exhibitions at which the nations of the world display their arts, crafts and industries.

The first important international exhibition was that held in London in 1851. It was promoted by the Society of Arts, and inspired by the Prince Consort. It was known as the Great Exhibition, and was housed in the wonderful glass building erected in Hyde Park to the designs of Sir John Paxton. This structure was afterwards rebuilt at Sydenham as the Crystal Palace, which was burned down in 1936.

The 1851 Exhibition was visited by over 6,000,000 people, making substantial profits that were used to found scholarships and for other educational purposes.

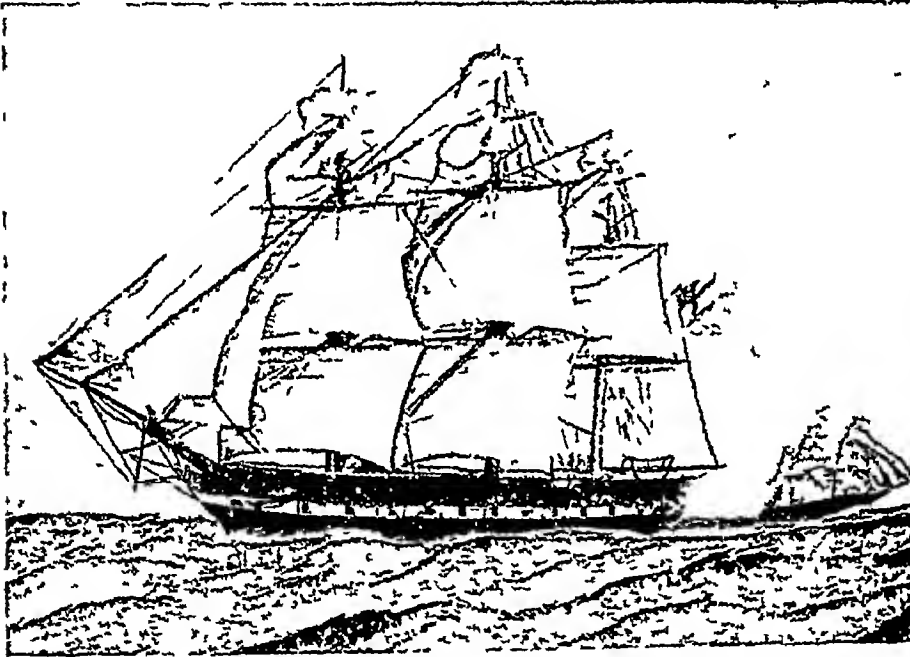
Since then many other international exhibitions have been held, outstanding among them being the Paris Exhibition of 1889, for which the Eiffel Tower was erected, that at Chicago, held in 1893, the Paris exhibition of 1900, the Franco-British Exhibition, for which the White City at Shepherd's Bush, was built in

## EXHIBITION

1808, the British Empire Exhibition at Wembley in 1924, the Paris Exhibition of 1937, and the San Francisco Exhibition and New York World's Fair in 1939. Trade exhibitions are also a feature of modern commerce, and every year specialized shows are held.

**Expedition.** Quite often today you may read in your newspapers of expeditions leaving England, the United States, or other large countries, going out to explore or investigate in other parts of the world, and had you been alive two thousand years ago, and been provided with a news service, you would have heard of the same type of expedition going out from the small civilized areas to the uncivilized parts of the world.

In most cases, these expeditions are setting out on trips of exploration, investigating new and unknown parts of the world, but this is



**A FAMOUS EXPEDITIONARY SHIP**

One of the most famous expeditions was that which is still known as the Challenger expedition from the name of the ship employed. H M S Challenger, seen above a corvette of 2,306 tons combining steam and sail, was dispatched by the government in 1872 under Sir George Nares on a scientific expedition round the world to examine the great southern ocean beds.

*From the painting by Admiral Pelham Aldrich, "The King's Ships" by Captain H. S. Lecky C.B. A.M. R.N. published by Horace Mervin.*

by no means always the case. In fact, more and more expeditions go now to comparatively well-known parts of the world, with motives quite other than those of pure exploration. Thus, many a big film company has to finance expeditions of great size and importance for filming native life, wild animals or the scenery and peoples of far parts of the world.

Then, again, we have the scientific expeditions, such as those which make a visit to some great mountain-top, just to secure photographs and information about a single incident, such as an eclipse of the sun. And every year such expeditions leave Britain to investigate the

## EXPEDITION

fisheries, the meteorological conditions, or the possibilities for trade of such areas as the north and south polar regions. Perhaps the most famous of all expeditions, and certainly one of the first and most important of this type, was that of the Admiralty ship H M S Challenger. From December, 1872, to May, 1874, this vessel, specially equipped for her job, sailed to and fro in the Southern Seas, collecting information, exploring the ocean, and gathering enormous amounts of material about marine life. You can get some idea of the work done by this one expedition from the fact that the report on it occupied fifty volumes, while in the Natural History Museum in London there are still hundreds of as yet unexamined specimens, collected by the Challenger's scientific staff.

Nowadays many expeditions are financed by business corporations, by museums, and by

syndicates who hope to gain from the results. Thus, in the 19th century, many big firms of orchid growers sent people out to collect and discover orchids for them, and there are still men who spend their lives collecting plants and trees for growers in the countries of the West. The fact that these men frequently carry out important actual explorations is incidental, for their original purpose is a commercial one in most cases. And even when the whole surface of the earth has been explored, there will be room for expeditions to investigate and examine, in

greater and greater detail, those parts of it which must always remain more or less inaccessible and hidden. You have only to think of the numerous expeditions, none of them as yet successful, which have had as their goal the conquest of Mount Everest, to see how one single achievement may hold the attention of men, year after year, until success is achieved. But it is not necessary even to cross the seas to make an expedition. There is still no country in the world, almost no district, which is fully known, and it needs little imagination for a boy or girl to turn every ramble in a new part of the countryside into a personal "expedition."

# FILLING the Blanks in the WORLD MAP

*What boy has not longed to be an explorer, to visit parts of the earth no man before him has ever seen? But the explorers have been so busy that there are now very few regions on the map still marked "unexplored"*

**Exploration.** Less than 50 years ago school maps showed many blank spaces marked "unexplored"



Africa was called the "Dark Continent"—a land of unknown peoples, savage beasts, deadly fevers and far reaching jungles. A large part of South America was pictured as a white man's grave. Australia and New Zealand were sparsely inhabited, and seemed to be at the "very ends of the earth." Tibet was the forbidden land, wherein no white man was permitted. Alaska

and nearly all of northern and central Canada were a trackless wilderness known only to Indians, and a few fur trappers, traders, and Hudson's Bay Company representatives. As for the Arctic and Antarctic, most people doubted the possibility of anyone ever reaching the Poles.

Today, however, one may drive a motor-car or fly in an aeroplane the whole distance from Cape Town to Cairo. It is common for men and women to set out fearlessly on hunting trips to the heart of the African jungles. Liners make regular trips up the Amazon, and tourists travel from Chile to Argentina by aeroplane or rail way over the Andes. Tibet is brought to us in cinematograph pictures, and both the North and South Poles have been reached, mapped, and photographed.

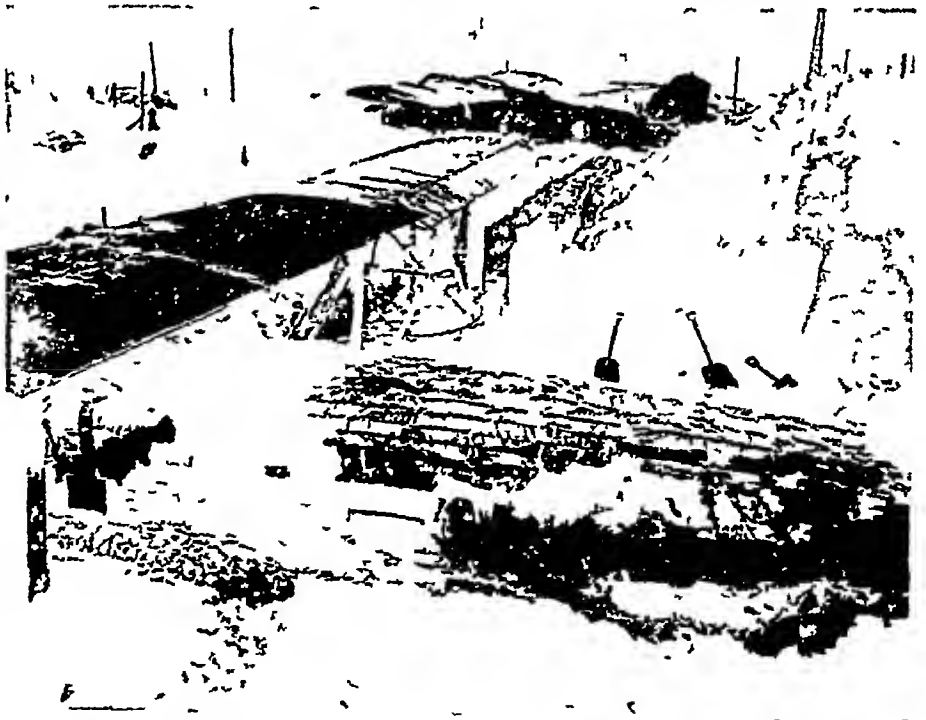
Today we enjoy food that comes from places that were unexplored 30 years ago or less. We wear clothing made from the wool of sheep

raised in Patagonia, Tierra del Fuego, and Australia. We drink coffee and cocoa grown in the heart of Africa and South America. Our furs may have been trapped on Arctic islands, the existence of which was undreamed of a few years ago. When we stop at a roadside filling station we purchase petrol made, perhaps, from oil brought from Central America.

## Business Needs the Explorer

The achievements of present day explorers have often been the result of the amazing advances made in science, commerce and industry. The ever-increasing use of motor-cars, aeroplanes and other motor driven machinery compelled the great oil companies to search for new sources of supply throughout the world. Engineers and prospectors seeking oil have explored and charted for the first time vast areas in Africa, Asia, Mexico, Central and South America and the East Indies. Other important explorations and surveys have been carried out by men in search of minerals, and by representatives of business enterprises seeking to establish new avenues of trade.

Occasionally an industrial development or an unexpected need has added to our geographical

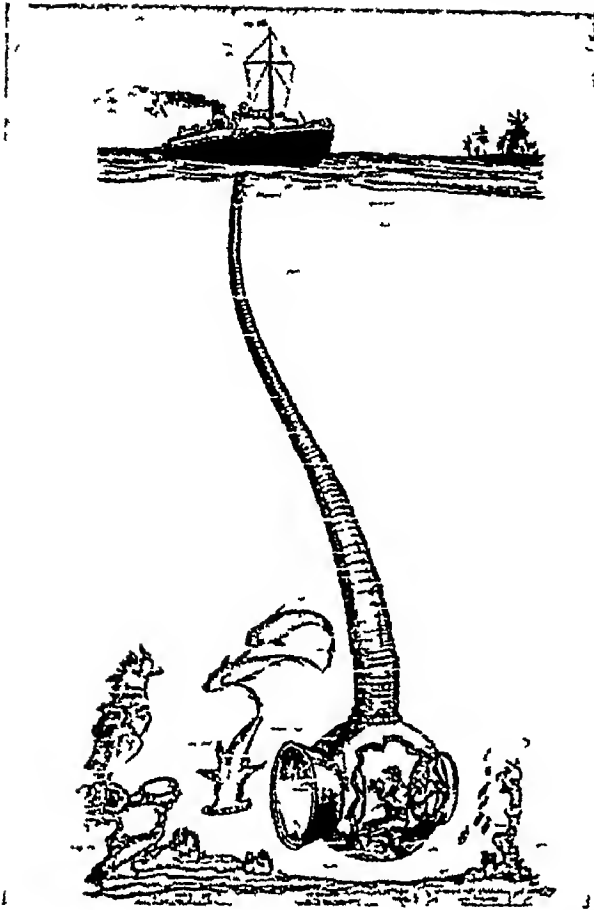


## SNOWED UNDER ON POLAR EXPLORATION

The difficulties that beset the explorer even when he employs the most modern of all vehicles—the aeroplane—is graphically shown in this photograph taken on Rear-Admiral Byrd's second expedition to the Antarctic in 1934-35. Both aircraft resting at their base, have been all but covered by a heavy fall of snow. Admiral Byrd's third expedition sailed for the Antarctic in 1939.

Wide World





#### TAKING PHOTOS UNDER WATER

Thus diagram shows how Mr J E Williamson photographs ocean life. He is let down from the ship, in a compartment six feet across, by a long flexible metal tube. His best pictures were secured near the Bahama Islands.

knowledge. When the sheep raisers of the Falkland Islands, the Argentine and southern Chile required new pasturage for their rapidly-increasing flocks, Tierra del Fuego was thoroughly explored and mapped. Had it not been for the World War and the suddenly increased demand for metals, rubber and many other articles, parts of Africa, South America, Asia and the East Indies might still remain virtually unknown. On the other hand, many of the world's richest mines were discovered by men in search of wild animals, primitive races, strange plants, ancient ruins or geographical knowledge. Such pioneers have added immeasurably to our knowledge of medicines, minerals and natural history.

Aeroplanes have roared over both the North and the South poles. Aviators have located and mapped important ancient ruins of the Maya in Central America. In Peru, Bolivia and elsewhere, aircraft have proved indispensable in mapping the Andes region, and in locating and photographing Inca and pre-Inca ruins.

As late even as September, 1937, an American party of explorers discovered on the Shiva Temple plateau (7,000 ft.) in Arizona, the lost world of the Grand Canyon. It is estimated that

this world has been isolated from civilization for from forty to eighty thousand years. Flints and arrow heads point to the last inhabitants having belonged to the later Stone Age.

In New Guinea seaplanes following the courses of the rivers helped explorers and prospectors to accomplish more in a few weeks than could otherwise have been done in years. The frozen wastes of northern Canada and Alaska have been brought into direct connexion with civilization by means of aeroplanes.

Motor-cars and motor-trucks made possible expeditions into the Gobi Desert of Mongolia. Although the expeditions conducted by Roy Chapman Andrews were primarily in search of fossils and traces of ancient Man, yet other scientific data were also secured. To most persons, the dinosaur eggs obtained by these expeditions, the first known to science, are regarded as their most remarkable discovery, but perhaps the most significant find was the skull and other parts of a prehistoric monster somewhat resembling a giant rhinoceros. The *Baluchitherium*, as it is called, stands 13 feet high and is over 24 feet in length.

Even the bottom of the sea has yielded its secrets. J. E. Williamson in his underseas chamber has secured cinematograph pictures of the ocean floor and its fascinating and strange coral forests, its fishes, and other forms of life. Dr. William Beebe has descended in a steel ball to depths of more than 1,000 feet and through glass windows has observed the weird, luminous inhabitants of the ocean depths.

However, long before either the Williamson apparatus or the Beebe sphere was dreamed of, scientists and oceanographers had been patiently and laboriously exploring the beds of the oceans. The explorations made by the Prince of Monaco added immeasurably to our knowledge of ocean currents and the haunts and habits of whales, as did the later work of the British research ships, *Discovery II* and *William Scoresby*. The surveys of the depths of the ocean made by the non-magnetic ship, the *Carnegie*, were also of great importance.

#### Looking for Man's Ancestors

Explorations for fossils have notably contributed to our knowledge. The discovery of the Rhodesian skull in South Africa and of the Peking skull in China, for example, threw new light on early Man. Sir Harry Johnston found the okapi in Central Africa. Pygmies have been tracked to their hiding places in the African forests and in New Guinea. Stone Age Bushmen were found by an expedition to the Kalahari Desert of South Africa. Bearded Indians of Bolivia were reported by A. Hyatt Verrill, and giant lizards, or "dragons," were found by an airman forced to land on the island of Komodo in the Dutch East Indies.



## EXPLORATION

Prominent in the story of modern Polar research are the names of Nansen, Peary, Amundsen, Scott, Shackleton, Stefansson, Byrd, Wilkins, Mawson, and Lincoln Ellsworth.

While archaeologists (among them the late Lord Carnarvon, H. Carter, Sir Flinders Petrie, Sir Leonard Woolley and Professor Garstang) have been revealing the past in Egypt, Syria, Palestine and the valleys of the Euphrates and the Tigris, explorers have been active in Greenland, Arctic Russia, Libya, Arabia, Central Asia, and South America. Dr Alfred Wegener's party in Greenland discovered that the island is a kind of trough or cup filled with ice and snow to depths approaching 10,000 feet, surrounded by mountains whose rocky sub-soil may be below sea-level. They also found that the layers of cold air extend more than 40,000 feet into the stratosphere.

Central Asia continues to attract the adventurous. Sven Anders von Hedin found a library of over 3,000 MSS in the Gobi Desert relating to wars of 1000 B.C. Sir Aurel Stein made valuable discoveries north and north-east of India. Sir Eric Teichman travelled by motor from Peking to Gilgit and thence by plane to Delhi. Peter Fleming and Ella Maillart rode on horseback from Peking across Sinkiang and down into India by way of the Pamirs, a distance of over two thousand miles, and Rosita Forbes, famous for her earlier travels in African deserts, travelled from Kabul to Samarkand. E. A. Colson, the first white man to do so, crossed the vast Simpson Desert in Central Australia. He was accompanied by a young Blackfellow and five camels. The journey took 16 days.

Much light has been thrown on hidden Arabia by the journeys of Charles Doughty, Gertrude

## EXPLOSIVES

Bell, T. E. Lawrence, Freya Stark, Major R. E. Cheesman, Bertram Thomas—who crossed the Ruba-el-Khali, "the terrible emptiness," from north to south in 1930, a feat repeated in 1932 by H. St. John Philby, who was the first to describe the city of Riyadh—and Herr Hans Helfritz, who crossed an uncharted desert to penetrate the "forbidden land of Yemen."

**Explosives.** Although we generally think of explosives in connexion with war, this represents their least important use. In fact, the modern world could really not progress without them. From the firing of the charge in the cylinders of a motor car to the demolition of houses or the blasting during mining operations, explosions play a part in our lives. The best-known and oldest explosive is gunpowder.

The pressure developed by ordinary gunpowder, when fired in a space which it completely fills, is more than 6,000 times that of the atmosphere. When we realize that "high explosives," such as gun-cotton, dynamite, nitroglycerine, mercury fulminate, and scores of others, are many times as powerful as gunpowder, we see what an amazing force has come into men's hands. Mercury fulminate ( $\text{Hg}(\text{CNO})_2$ ) is the most violent of all the explosives in practical use, for it develops under proper conditions a pressure of 200 tons per square inch. It is very unstable, however, and the slightest concussion suffices to disintegrate it and liberate its nitrogen and oxygen gases with devastating force.

An explosion, we see, is simply the violent liberation of the gaseous elements of unstable chemical compounds. From this it is easy to understand the effects of an explosion when the charge is confined in a narrow space as in



### EXPLORING THE UNKNOWN GOBI DESERT

Sven Hedin, the Swedish explorer, has made many adventurous journeys in Asia, including three in Tibet, during which he attempted to enter the 'forbidden city' of Lhasa. He is a particularly valuable explorer, for he makes maps of many of the places he visits. In 1931 he investigated the Gobi Desert to search for traces of an ancient civilization. In this photograph you see his camp pitched in the midst of an unknown wilderness—nothing but sand as far as eye can see.

*Sven Hedin Expedition*



ONE OF THE MANY PEACEFUL USES OF EXPLOSIVES

Explosives are not always used in war and fireworks. Though always destructive, they can be very useful. Here you see dynamite (or perhaps it is "T N T"—trinitrotoluene) doing in a few seconds what it would take workmen nearly a week to do. This bridge, on the Great Western Railway near Overton on-Dee, Shropshire, had to be demolished—and blowing it up was the quick modern method. You cannot see any workmen because they have prudently gone out of range of the flying debris.

blasting or firing a howitzer gun. The expansive force of the released gases destroys anything impeding it or, in the case of a projectile, imparts to it a tremendously high velocity.

Any compound substance whose molecules comprise inert gases and which breaks up easily and suddenly, producing a large volume of gas, is an explosive. There are some, like nitrogen iodide, which are so sensitive that they will explode at the tread of a fly or the touch of a feather. There are others which require a hot flame to set them off.

Broadly speaking, explosions may be of two kinds—extremely rapid burning, as in the case of gunpowder, and detonating, as in the case of mercury fulminate or nitro glycerine. In the first case, the flame starts in one spot and spreads quickly over the entire mass. In the case of detonation, however, a shock or jar causes all parts of the substance to disintegrate at once.

Gun-cotton illustrates both kinds of explosion. If set off by a flame it will usually burn rapidly, creating a large quantity of gas, but without exhibiting extreme violence. If, however, a cap or primer or fuse made of some detonating substance like mercury fulminate be set off in contact with the gun-cotton, the latter will in turn be detonated. The ordinary dynamite stick can be set on fire with a match without great danger, but will explode with shattering force in response to a fulminate cap.

Since the first form of explosion is merely extremely rapid burning, it follows that any inflammable substance can become more or less explosive if it can be made to burn rapidly enough. Since all ordinary fire or combustion is caused by the combination of the burning substance with the gas oxygen (*see Oxygen*), it follows also that the more oxygen that is present the faster will be the blaze.

For example, coal-gas, hydrogen and petrol and other vapours are themselves non explosive, but they become explosive if they are mixed in the right proportions with the oxygen of the air. This principle is used in the motor car and all gas engines.

Explosives which are to be used for practical purposes, however, cannot depend upon the air for their supply of oxygen. It must be provided in concentrated form so as to be readily available. In black gunpowder, which is a mixture, not a compound, of charcoal, saltpetre and sulphur, the saltpetre (potassium nitrate,  $\text{KNO}_3$ ) provides the necessary oxygen (*See Gunpowder*). But most explosives are true compounds, in which each molecule contains the oxygen necessary for the explosion. A few of the detonating explosives, such as nitrogen iodide, contain no oxygen, their action does not depend upon combustion, but upon the simple splitting away of the different parts of the compound, and their expansion under heat.

Almost all explosives contain nitrogen. This gas is one of the most "unsociable" of all substances and in its desire to "get away" by itself, it is usually ready to break up any compound of chemicals of which it may form a part (See Nitrogen). In the manufacture of the high explosives, nitrogen is usually introduced through the action of nitric acid. Thus, with some cellulose substance like common cotton, nitric acid forms gun cotton, with glycerine it forms nitro glycerine, with carbolic and sulphuric acid it forms picric acid, the base of lyddite, melinite, etc., with toluene, obtained from coal tar, it forms trinitrotoluene, or trinitro toluol (T.N.T.), one of the commonest and most powerful of military high explosives. Dynamites are mixtures of nitro glycerine with some absorbent substance which tempers its sensitive violence.

High explosives are too violent to be employed as propelling charges in firearms. For this numerous kinds of smokeless powders are

manufactured, most of them consisting of some nitro cellulose dissolved into a gelatine.

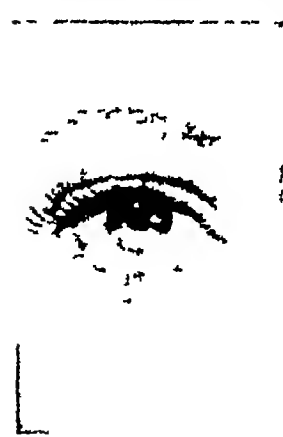
Explosives are of immense value in scores of peaceful pursuits—in mining, quarrying and engineering enterprises, in making fireworks, signal lights and rockets. Among great engineering feats thus made possible are the Sovern and Mersey tunnels, the Panama canal, and such works as the Boulder and other dams in rocky districts. The explosion of a thermite bomb of powdered aluminium and iron oxide produces a heat up to 5,000 degrees Centigrade, and the molten iron is used for rapid repairs on railway tracks, etc.

When pile drivers are not available, their work can be done by exploding dynamite on an iron plate placed on top of the piles. Floating derelicts which endanger ships at sea are destroyed with explosives, and great fires are brought to a halt by blowing up buildings in their path. Farmers use them for breaking up boulders, felling trees and loosening the soil.

## What HAPPENS when We 'SEE' THINGS

*This article tells of the marvellous instrument that picks up the messages of light and carries them to our brain, of its complicated and delicate structure, and of how we may keep it in good working order*

**Eye.** The eye, whether of Man, cat, fish or hawk, is specially adapted for use where its owner lives. For example, in the daytime the



pupil of the cat's eye looks like a narrow slit because the curtain has been drawn together in order to shut out excess light. The eye of the owl, when he hunts by night has the curtain pulled back, to admit the maximum of light. The dragon fly has many thousands of facets, or little eyes, in each eye, in order that it may see in any direction.

The fish, which lives in deep water, often at the bottom of the stream or lake, has its eyes placed well towards the top of its head, looking upwards as well as sideways. Again, the hawk, which gets its food by darting upon its prey, must have its eyes so made that it can rapidly change the focus and take a true picture at constantly changing distances, otherwise it would not get the prey that it swoops down on.

Now, this camera of the human body, (the eyeball) resembles a sphere with a bulge on the front, where the light enters. Six muscles, four straight and two oblique, are fastened to the

outside of this ball, so that it may be turned up or down, to the right or to the left, or slightly rotated—thus giving an extensive field of vision without having to turn the head.

The outside coat of this ball—known as the *sclerotic* coat and seen as the "white" of the eye—is tough and strong. The bulge in front is transparent and is called the *cornea*, it is really the "window" of the eye. Just underneath this tough sclerotic coat lies the dark middle, or *choroid*, coat which carries the blood-vessels that nourish the eyeball. The choroid bends away from the cornea in front to form a coloured curtain (black or brown or grey or blue, just as your eyes happen to be), called the *iris*, and in the centre of this iris is an opening known as the *pupil*. Circular and radiating muscles control the size of this opening, according as you need more or less light—doing the same as the "iris diaphragm" of your camera lens.

The inside lining of the eyeball—extremely thin and delicate, yet very complex in structure—is called the *retina*, on this surface a picture of what is "seen" is printed "upside down."

From the retina spring nerve fibres which are gathered together to form the *optic nerve*. This great sensory nerve leaves each eyeball at the back and passes to the brain. The endings of its nerve fibres in the retina are stimulated by light, and through the fibres the stimulus passes along the optic nerve to arouse the sensation of sight in the brain. The nerve fibres are not

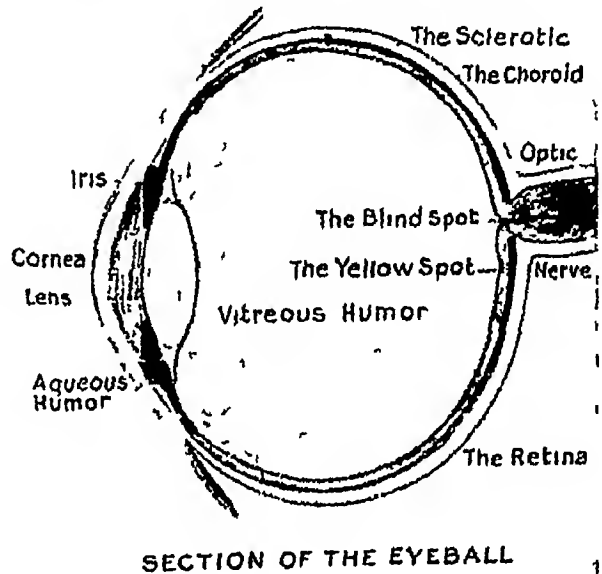
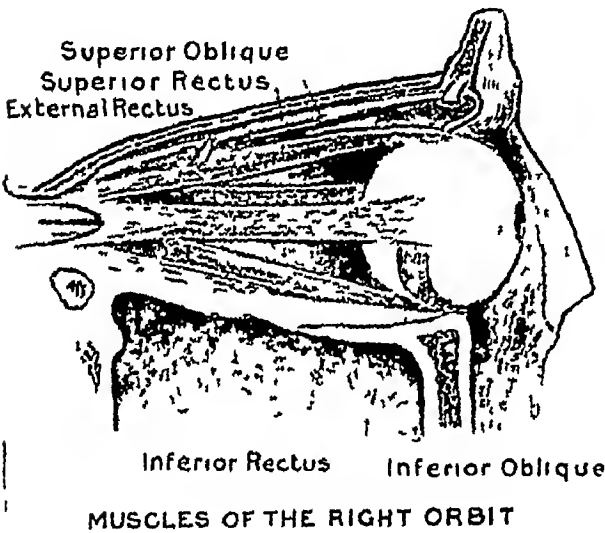
## EYE

themselves sensitive to the light, hence where they come together to form the optic nerve we have what is known as the "blind spot" of the eye. One tenth of an inch from this spot is the yellow spot. This lies exactly in the centre of the posterior part of the retina, and in a line with the central axis of the globe, and it is there that the sense of vision is most acute.

The interior of the hollow eyeball is occupied by the lenses. In front, between the cornea and the iris and pupil, is the *aqueous humour*, a clear, transparent liquid. Immediately behind the pupil is the *crystalline lens*, a solid which contracts and expands as we look at near-by or distant objects. Behind this and occupying the greater part of the eyeball is the *vitreous humour*, a jelly-like substance which, as its name implies,

optic nerve. There the proper meaning is interpreted in our consciousness, and we say we "see" a house, a dog, or a train. In reality, it is the *brain* and not the eye that does the seeing. A useful comparison is the telephone. It is not the voice that goes over the wires, but electric currents corresponding to the voice. These currents are again formed into sound in the receiver. So it is not light that goes over the optic nerve, but nerve currents corresponding to the light, and these nerve currents cause the sensation of sight in the brain.

Often various parts of the human eye are abnormal. Sometimes the eyeball is too long or too short from back to front, and then the person is near-sighted or far-sighted, as the case may be. The cornea may not be a section of a



### THE 'LIVING CAMERA' THAT WE ALL CARRY IN OUR HEADS

To the left is a picture showing how the eye may be turned towards any external object by means of its muscles. A pull upon the "external rectus," for example, turns the right eye to the right. The other picture is of a section of the eye from front to back, and shows how like a camera it really is. The cornea is the protecting window in front, while the coloured iris is the diaphragm. Muscles attached to the lens pull its edges apart and flatten it, or relax and let the lens thicken for focusing.

is clear and "glass-like" in its transparency. The purpose of the humours or fluids is to keep the eyeball filled out at a constant tension.

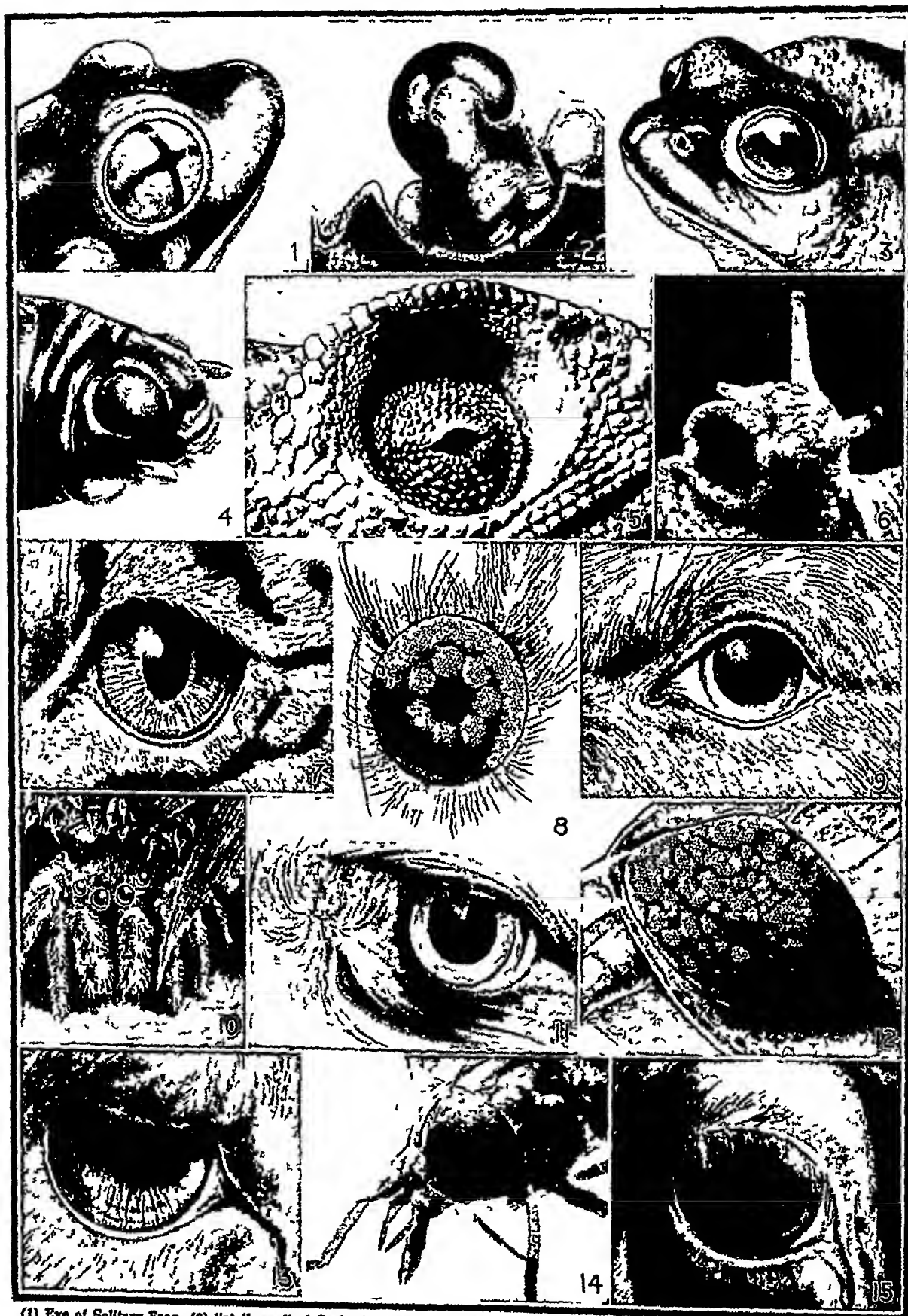
Now what happens when we "see" an object is this: the rays of light from that object enter the pupil, pass through the aqueous humour, crystalline lens and vitreous humour, and strike the retina at the back. These rays of light are so refracted, or bent, in passing through the lenses as to form an inverted or upside-down picture on the retina. The picture itself is not carried to the brain, but each part of the retina is stimulated strongly or weakly and by this or that colour, according to what part of the picture falls upon it. Therefore, each fibre carries a corresponding influence, or impulse.

These thousands of impulses correspond to the picture and are carried to the brain by the

true sphere, hence the picture is untrue, being indistinct in some directions and strikingly clear by contrasts in others, a condition called astigmatism. Sometimes these abnormal conditions are caused by ourselves, either we are careless in the way we use this camera, or else we do not know how to protect it.

We read in bed and strain the muscles, we read with a glaring light or a poor light on the printed page, or with the light directed into our eyes instead of on the printed page, we read in the rapidly moving train and thus overwork the focusing muscles, or for too long a time, paying no attention to the fact that our eyes are uncomfortable. We read when we are ill, or when we have got something in an eye and have neglected to go to the oculist to have it removed.

# EYES: SOME STRANGE WINDOWS ON THE WORLD



(1) Eye of Solitary Frog, (2) "stalk eye" of Crab, (3) eye of the Toad, (4) Whirligig Beetle, (5) the Chameleon's eye (6) eyes of the Snail on stalks, (7) Cat's eye (8) Moth's eye (9) eye of the Dog, (10) Spider eyes, (11) Eagle's eye, (12) Grasshopper's eye, (13) Sheep's eye, (14) eye of the Fly, (15) the Cow's eye. Nos 4, 8, 12, and 14 are compound eyes.



The proper fitting of glasses is very important, especially in the young. Never get glasses from an untrained optician. A qualified oculist should always be consulted.

This organ of sight is too delicate a piece of machinery, and our happiness depends in too large a measure upon it for us to neglect it. When we destroy a camera, we can buy a new one, but the wealth of all the world cannot replace an eye that is destroyed or has become permanently blind. Artificial eyes of glass are now made which so marvellously imitate the real ones that the difference can scarcely be detected. But they lack, of course, the chief quality of an eye—you cannot see with them.

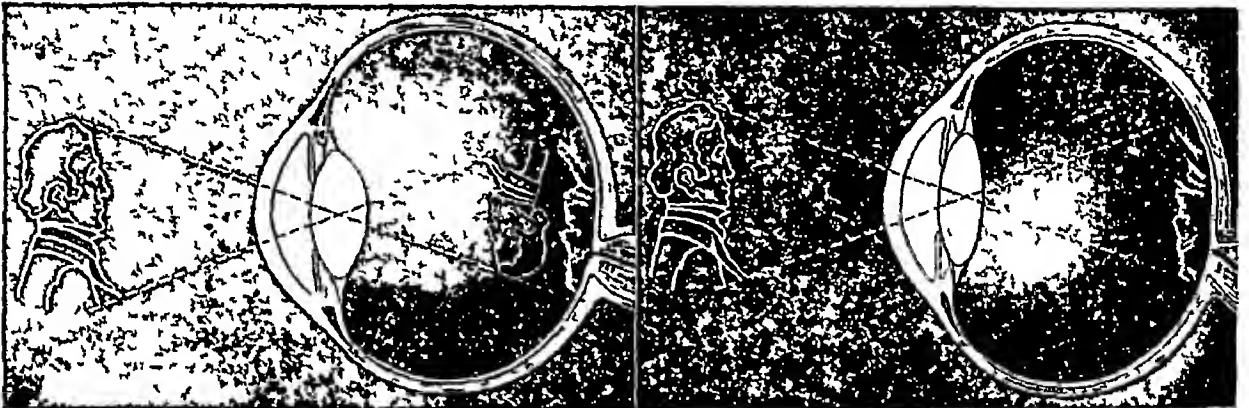
There are about four people in every hundred whose eyes seem to be perfect except in distinguishing colours. According to one experimenter's figures, one person out of every 55

the wilds of a great continent, which was then a comparatively unknown land whetted Eyre's appetite for more daring travels.

After one or two minor journeys into the great arid lands of Central Australia, Eyre set out, in 1840, from Adelaide on his famous overland journey to the west coast of the continent. He had with him only one white companion and three natives, a few horses, and six sheep.

From the first their great difficulty was the scarcity of water, and after travelling for a week or two—the entire journey was done on foot—they were in serious straits.

"We were now 128 miles from the last water," wrote Eyre at one point. "We had been four whole days and nights without a drop of water for the horses, and almost without food, for, parched as they were, they could not feed upon the dry and withered grass we found."



#### HOW THE HUMAN EYE FOCUSES WHAT IT SEES

In cameras the lenses must be moved forwards and backwards to get exact focus alike of near and distant objects. The lens in the 'human camera' cannot be moved, but the eye accomplishes the same result by changing the curvature of the lens. In the picture on the left the eye is in normal position, and if unchanged would focus the image too far in front of the retina. The muscles attached to the lens flatten it however and thereby the image is thrown back upon the retina.

cannot tell red from green, and one in 50 confuses brown and green. Pink and yellow look alike to some people, and blue and green to others. A very few persons can distinguish only light and shade, seeing everything as black and white. The cause of colour blindness is thought to lie in the layer of the nerve fibres in the retina known as the "rods and cones."

In many cases it appears that a defective colour sense can be improved by proper education.

Women see colours better than men, as a rule. Their interest in dress, house furnishings and flowers makes them more familiar with colours. Yet there are men silk dyers so expert that they can accurately grade 60 shades of grey.

**Eyre, EDWARD JOHN (1815-1901)** Born at Hornsea, Yorkshire, on August 5, 1815, Eyre sailed as an emigrant to Australia in 1833, and became distinguished as an explorer there.

His first travels in Australia were undertaken as an "overlander"—a man who drove the great herds of cattle overland to some far away market on the coast. These journeys across

On another occasion, during the same perilous journey, Eyre was reduced to collecting with a sponge the dew which in the early morning sparkled on the bushes that grew on the dry plains. In an hour he had collected and squeezed out enough dew to fill a quart pot. With this he made his tea.

One night two of the natives in the little party, fearing they were being led into the desert to die of thirst without any chance of escape, killed Eyre's white companion in the night, and went off with all the food they could carry.

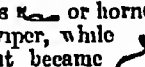

Day after day Eyre and his companion struggled on, often so parched with thirst under a blazing sun that they fell down exhausted. The entire journey occupied over a year before the two weary travellers at last reached Albany.

Appointed governor of Jamaica, Eyre in 1865 crushed a native rebellion with alleged severity and was recalled and put on trial. Influential friends, including Carlyle, rallied round him, however, and he was acquitted. He died on November 30, 1901.





ph represents the Greek letter Phi  $\Phi$ , which, we are told, was originally pronounced *p h*, like the final sound of *lip* in English, but in time came to be equivalent to Latin *f*

THE letter F looks so much like E that some have thought it developed from the same form, but such is not the case. It has its own interesting story to tell. Long ago it was the Egyptian cerastes  or horned asp. The two bars are survivals of the two horns of this poisonous viper, while the vertical stroke represents the body. Written in a running hand it became  and then the Phoenician  $\varphi$ , which was called *hau* or *lau* meaning a "hook" or "peg." The Greeks wrote it much like our Y and called it *Digamma* from its fancied resemblance to two united gammas or G's, one above the other. We fail to find it in the modern Greek alphabet, for after a time it dropped out of general use. The western Greeks continued to use it for some time, however, and the Romans adopted it from them, giving it the form which we now use as well as its sound, "ef." Its original sound, as you might guess from its Phoenician name was that of our *w* or *v*. And it was sounded as *w* even by the Greeks. The *f* sound in English is often represented by the digraph *ph*, as in "philosophy." This

**Fabre, JEAN HENRI** (Pron *fah'br*) (1823-1915) Born of humble parents in Aveyron, France, December 21, 1823, Fabre was from childhood greatly interested in the tiny insect guests of plants, stones and sands. But in early life he was too busy to give much time to the world of Nature he loved so well.

When he was nineteen he left the College of Rodez and took charge of a primary school at Carpentras, receiving a salary equivalent to £28 a year. His very first month's salary was spent in buying a book on insects.

Fabre married early, and soon had a large family to support with the small salary received as Professor of Natural Philosophy at the College of Ajaccio in Corsica, where he now was, and later at the Lycée of Avignon in southern France. His was a long life of great poverty, sacrifice, struggle and superb perseverance.

At last, after forty years of unceasing toil, Fabre retired to a humble home at Sérignan, Vaucluse, where he could give himself without reserve to his insects' paradise. Here he remained for the rest of his life, quite unconcerned about riches, caring nothing for worldly honours, sacrificing everything to his work, and gaining an astonishing knowledge of insects.

Until nearly eighty years of age he was almost unknown to the world. Then the poet Mistral interested some scientists in him and rescued "the insects' Homer," as he came to be called, from poverty and obscurity. His greatest work, "Souvenirs Entomologiques" ("Souvenirs of Insect Life") was finally crowned by the French Academy, and five years before his death, which took place October 11, 1915, he was granted a pension.

During his long life this great naturalist, whom Darwin called "a savant who thinks like a philosopher and writes like a poet," wrote many books, enthusiastic records of his patient observations. He poked into the private lives of insect "citizens" and revealed what he saw in stories curious, quaint, happy or tragic, as charming as fairy tales. Though many of his conclusions were erroneous, he will live forever as an observer without equal.

Among Fabre's principal works as translated into English are "Social Life in the Insect World" (1912), "The Life of the Spider" (1913), "The Life of the Fly" (1913), "The Glow worm and other Beetles" (1915), "The Life of the Grasshopper" (1917), "Our Humble Helpers" (1918), "The Wonders of Instinct" (1918), and "The Mason Wasps" (1919).

**Factories AND FACTORY LAWS** A million slaves toiling every day from sunrise to sunset, but using the spinning-wheels and hand-loom of

200 years ago, could not make as much cloth in a year as is now turned out in a week in the great cloth factories of the world. This is the estimate which an economist gives of the enormous increase in Man's productive power through the invention of machinery and the organization of the present day factory system.

In the articles on Spinning and Weaving, on the Industrial Revolution, and in the sketches of the inventors—James Hargreaves, Richard Arkwright, Samuel Crompton, Edmund Cartwright, James Watt, and others—you may read of the first steps which brought about this tremendous revolution.

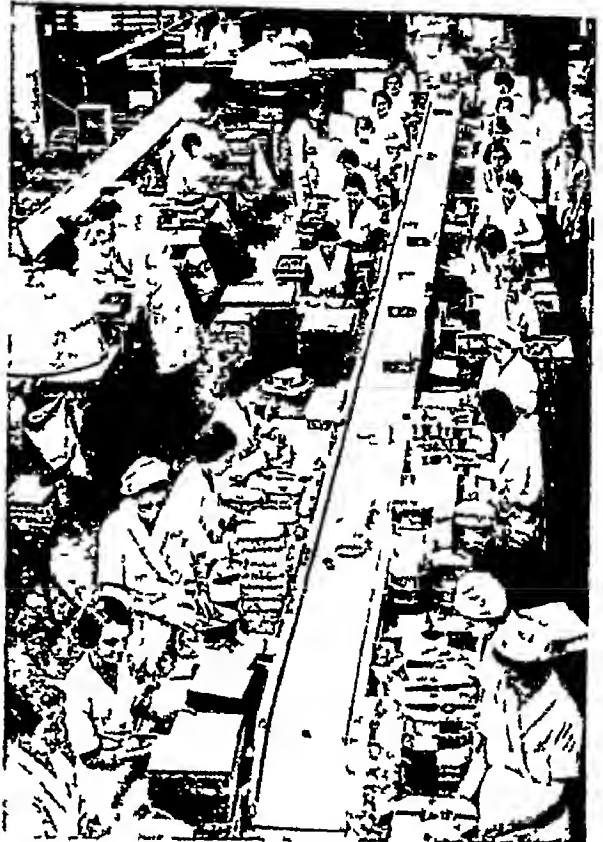
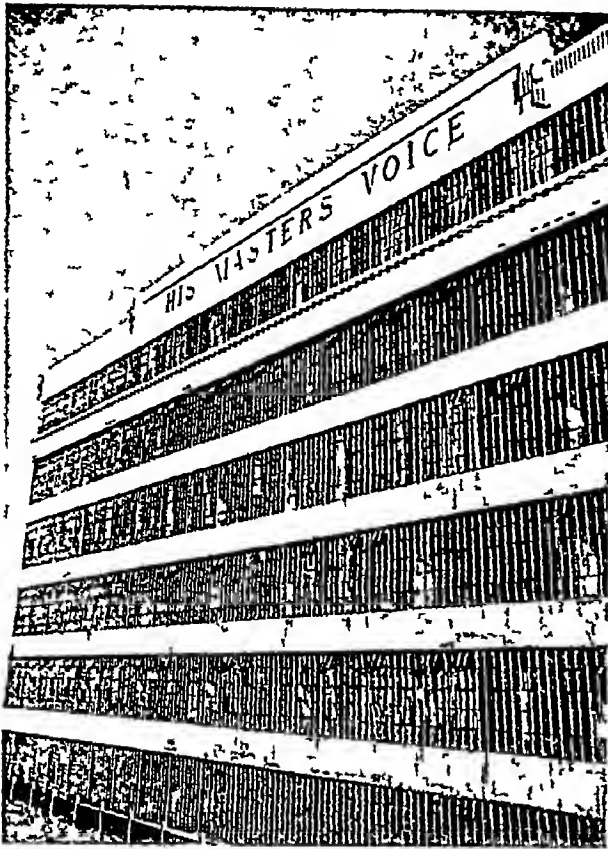
Manufacturing now is no longer carried on by workmen in their own homes, using



JEAN HENRI FABRE

This great French entomologist lived to be 92, and up to the time of his death continued that patient investigation that made him such a great authority on insect life.

## FACTORIES



### MODERN FACTORY DESIGN AND CONDITIONS

In modern factory design the attention given to natural lighting is more and more evident, and the picture on the left is an example of the extensive use of glass in the construction of the building. On the right is the interior of a Bedford factory, where girls in white overalls are busily engaged in packing chocolates and crystallized fruits for export as well as for home consumption. Notice the moving belt running the length of the floor and the hygienic conditions in which the girls work.

their own tools and materials, working when they please, and owning little plots of ground from which to supplement the earnings of their trade. In place of the simple hand tools such as had been used for hundreds or thousands of years they now use vast and complicated machines, housed in giant factories and driven by water-power, steam power or electricity. Instead of a single workman making an entire pair of shoes, the process is so subdivided that 250 persons take part in the production. The machines, buildings and material moreover, belong to some person or group of persons who supply the money, or "capital," and the business is conducted by executives with the skill necessary to make the enterprise profitable. The workmen are simply employees, dependent on the wages they receive.

English manufacturers at first jealously guarded the secrets of their inventions. Machines were not allowed to be shipped from England, and even sending plans abroad was forbidden. For this and other reasons the factory system developed later in other countries than in Great Britain. It was not until the early 19th century that the factory system as known in England began to develop in France, Germany and other countries of continental Europe.

As a result of the factory system, prices of many manufactured articles have dropped and

conditions of life have generally improved. The worker has shared in this betterment. His food and clothing are better, while chances for advancement are more numerous.

At first, however, the factory caused much suffering among the working class. Its untiring, swiftly moving machinery rendered redundant the labour of many workers. Moreover, since women and children could operate the machines as well as men, and since their labour could be obtained for less wages, thousands of men were thrown out of employment and the general level of wages became pitifully small.

Working hours were terribly long. Children as young as five and six toiled from 10 to 15 hours a day, women worked from 12 to 16, and men up to 18 hours a day. Factory work also was monotonous and depressing, and the conditions under which it was carried on were usually unhealthy. Men became nervous, diseased and vicious. Babies of factory women, lacking their mothers' care, died in great numbers. The little children who were employed in factories were pale and sickly, and if they survived to adult age grew into nervous, stunted, depraved men and women, who became dangerous elements in the national life.

But such conditions could not last. In 1833 the employment of children under nine years of age

## FACTORIES

in factories was prohibited by the British Parliament. The hours of older children were greatly shortened, and provision was made that all children under 13 should attend school at least two hours a day. Later other British laws were successively passed limiting the working hours, improving sanitation, providing for safety devices on dangerous machinery, prohibiting night work for children and all work in mines for both women and children.

If the factory system and its evils first arose in Great Britain, it should not be forgotten that the legislation to remedy these evils began there also. In other countries similar laws have been enacted, and in almost all factories today working conditions have greatly improved. Only in far off Japan, and other Oriental countries where the factory system was late in developing, do the conditions now resemble the terrible ones which prevailed here a century ago.

**Factors.** In the various subdivisions of arithmetic (*see* Addition, Division, Fractions, Multiplication, Subtraction) numbers are dealt with generally. But when we come to factors we begin to deal with quantities of limited application. Thus, any two numbers may be multiplied and the answer obtained in whole numbers. But not every number can be divided by any other number without leaving a remainder. When, however, a number is divisible by another number, and the answer obtained is a whole number, the quotient is called a factor. Only when a number is a factor of another—that is, a number which, multiplied by some other number, gives the second one—can it be divided exactly into it so as to give an answer in whole numbers. For example,  $7 \times 2 = 14$ , and  $14 \div 5 = 70$ . The numbers 7, 2, and 5 are the factors of 70, so any of them, or any combination of them (14, 10, or 35), will divide into 70 exactly, and no other whole numbers (save 1 and itself) will, without giving a remainder.

This rule explains why so many vulgar fractions cannot be converted into exact decimal fractions. The base of our number system is 10, which has only three factors, 1, 2 and 5. Adding additional 0's beyond the decimal point, as we do in converting vulgar fractions into decimal ones, only introduces these same factors again, making it impossible to obtain an exact division with any divisor containing any factor other than 1, 2 and 5. Such factors are called prime factors. (A prime number is one divisible only by itself and 1, such as 3, 5, 7, 11, 13, etc.)

To find the factors that make up a given number, therefore, is important both as a test for the possibility of division, and often as a substitute for it. Thus, suppose we are told to divide 231 by 21. Instead of using long division we find the factors of each number

## FACTORS

Thus 7 and 3 are the factors of 21, and we find by trial (mental) division that both 3 and 7 go into 231 without leaving a remainder. We divide 231 therefore by 3 and 7 in turn, getting 77 and 11, and 3, 7 and 11 are our answers. Therefore  $231 = 3 \times 77 = 3 \times 7 \times 11$ , and, as none of these numbers is further divisible, the prime factors of 231 are 3, 7 and 11. But we know the prime factors of 21 to be 3 and 7, therefore 231 divided by 21 becomes

$$\frac{231}{21} = \frac{3 \times 7 \times 11}{3 \times 7}$$

Cancelling out 3 and 7 from top and bottom we get

$$\frac{231}{21} = 11$$

Cancellation is the name given to the process of dividing out common factors.

Useful steps or aids to quick recognition of factors are

- 1 If a number ends in 0 or 5, it is divisible by 5
- 2 If the sum of the digits is divisible by 3, the number is divisible by 3
- 3 If the last digit is even (that is 2, 4, 6, 8 or 0), the number is divisible by 2

Under these rules we see that neither 231 nor 21 is divisible by 2 or 5. But  $2+3+1$  (the sum of the digits of 231)  $= 6$ , and  $2+1=3$ , and each sum is divisible by 3. Dividing 231 by 3 gives 77, and dividing 21 by 3 gives 7, and from our multiplication table we get the final factor 11.

Again, suppose we want to divide 15 into 420. The rules tell us that 420 is divisible by 2 (because 0 is even), by 3 (because  $4+2+0=6$ ), and by 5 (because 420 ends in 0). Dividing  $2 \times 3 \times 5 (= 30)$  into 420 gives 14, which factorizes into 7 and 2, both prime. That is,  $420 = 2 \times 3 \times 5 \times 2 \times 7$ . The number 15 has only 2 factors (except itself and 1), 3 and 5. Cancelling out the factors common to both (3 and 5) leaves  $2 \times 2 \times 7$ , or 28 as our answer.

### Finding Highest Common Factors

Factorizing determines quickly any highest common factor—that is, the largest number which will divide evenly into two or more given numbers. To determine the highest common factor (often written H C F) of 660, 1188 and 2520, we factorize each (using the hints just given) and so reduce each number to its prime factors, as

$$660 = 2 \times 3 \times 5 \times 2 \times 11$$

$$1188 = 2 \times 3 \times 2 \times 3 \times 11 \times 3$$

$$2520 = 2 \times 3 \times 2 \times 5 \times 2 \times 3 \times 7$$

We at once see the factors common to all three to be 2, 3 and 2, and as  $2 \times 3 \times 2 = 12$ , this is the highest common factor we want.

### Finding Least Common Multiples

Factorizing is useful also in finding the least common multiple—the smallest number, that is, which will contain two or more other numbers

as factors Suppose we want to find the least common multiple (often written L C M) of 660, 840 and 1,008 Factors of  $660=2 \times 2 \times 3 \times 5 \times 11$ ,  $840=2 \times 2 \times 2 \times 3 \times 5 \times 7$ , and  $1,008=2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 7$  Now the L C M must contain each factor as many times as each number does The factors therefore will be  $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 7 \times 11$ , which, multiplied together, give 55,440, the L C M wanted

The ready use of factors is a valuable aid throughout arithmetic In algebra the knowledge of factors is even more valuable, providing us with short cuts to intricate problems

**Fagging.** The custom of allowing boys of the sixth form, and, in some schools, the fifth and also the cricket and football teams, to employ younger boys to "fag" for them is very old-established in English public schools At one time "fags" had to perform all kinds of hard and heavy duties, but in our day these are usually confined to running errands, tidying studies, and the like The system is supposed to teach willing service in the "fags" and ability to control inferior officers in their "masters," but these are doubtful benefits In old school stories, like "Tom Brown's Schooldays" and "The Fifth Form at St Dominic's," the cruelties of the "fagging" system as it was exposed, but, in the absence of much complaint on the subject in modern times, it can be concluded that there is no harm in it, as at present practised, unless it interferes with the "fag's" studies

**Fairs AND MARKETS** At the present day fairs are connected in most people's minds with "all the fun of the fair"—the roundabouts, boat swings and coconut shies which for a few days in every year occupy the village green But in earlier days fairs were important trading centres When a nobleman of the 13th century needed a new sword or lance, his lady a new gown of state, and his peasants a ploughshare or other tool, where did they seek them?

Towns were far apart, and usually contained only a few small shops in which merchants displayed the wares made by their journeymen and apprentices in their own workrooms So both nobles and peasants would usually wait to supply their different needs until the time of one of the large annual fairs, held in certain privileged cities, commonly at the time of a great Church festival Then they hurried to the town, to gaze in wonder at the marvellous goods from far and near shown in the booths, and to buy such of them as they needed or fancied, and whatever else their purses, much fuller then than on other occasions, would allow

And what a different aspect the town wore at such a time compared with ordinary days! The narrow streets were now lined with wooden booths and stalls, or, perhaps, a special enclosure was set aside for the fair at the city's gates Here were woollen cloths from Flanders, and there costly spices from the East, with silks and velvets of wondrous hues From Gascony came wine, from Norway tar, and from Germany furs



MITCHAM FAIR WHEN THE LIGHTS ARE LIT

Held annually in August, Mitcham Fair dates from very early times It is run on a huge scale, and as one of London's famous institutions is very popular with visitors from abroad, especially Americans The usual "fun of the fair" is to be had there in every variety and abundance, and some of the most amusing "characters" associated with fair life come to Mitcham In times much less industrialized than the present Mitcham Fair was a popular buying centre for all manner of things The neighbourhood is well-known for its market-gardens and for its lavender and other herbs

## FAIRS

and amber Here was the street of the goldsmiths, and there those of armour smiths, weapon makers, saddlers, and the like And at the end of the street, on raised platforms, jugglers and tumblers enacted their feats of skill, while puppet shows drew about them crowds of admiring beholders, and ballad singers sang their lays Everywhere crippled or blind beggars reaped their harvest from the passers by

The lord whose right it was to hold the fair levied fees and tolls upon the merchants, in return for which various privileges were granted them Disputes were settled summarily by the "Court of Piepowder" (French, *pied poudreux*, meaning "dusty foot") Quick justice was dealt out not only to all who broke their agreements, but also to those who cheated their customers

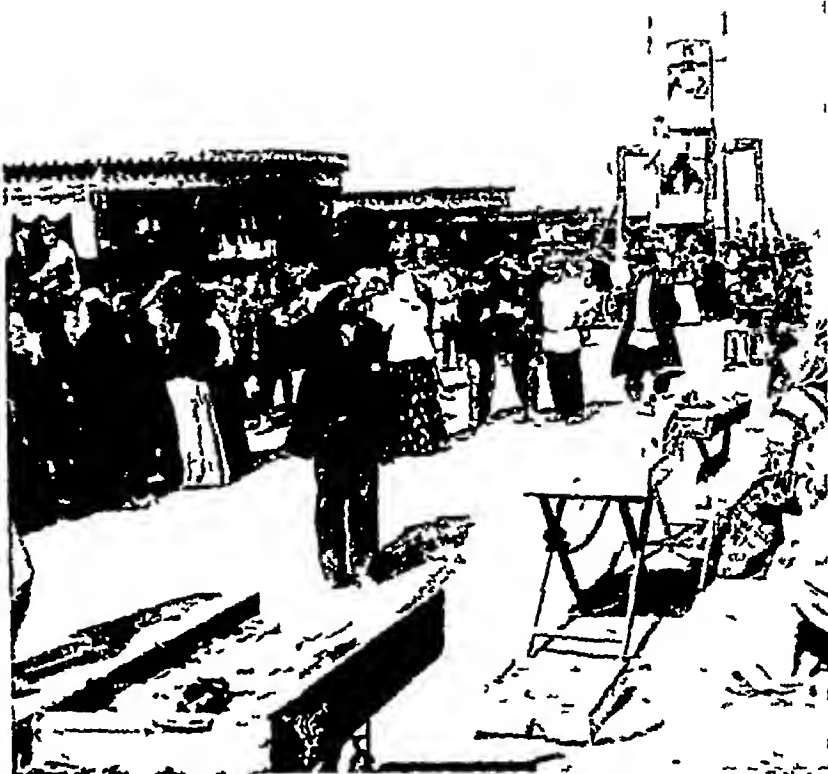
For a week or two the fair continued Then the merchants packed up their wares, and, with a motley vagabond train of people of all nationalities, moved on to another fair

The right to hold such a fair was one of the most highly prized privileges in the Middle Ages, and it was one which could be obtained only by a charter from the king or some lord Among the most famous fairs were those of St Bartholomew at Smithfield in London, the Leipzig fair in Germany, and that of Troyes in France From the weights used at the last we get our system of "Troy" weights, and from the laws and customs in force at these fairs we get the beginnings of our system of commercial law

#### Market-day in the Country

To many towns which did not have a fair, and also to some which did, was granted the privilege of holding a market on a certain day of the week Here were sold homespun linens and cloths from the local weavers, as well as the noisy, gagbling geese, cackling hens, squealing pigs, and wheat, rye, and vegetables brought by the peasants from near by villages In many respects it reminds us of the markets you may see in many towns today, to which farmers from the surrounding parts take their produce on a set day

The medieval fair survives in some sections where commerce is still primitive, as in the interior of Asia The fair of Nijni Novgorod (Gorki) in Russia, which was not abolished until 1930, used to draw from 100,000 to 200,000



#### AT A GREAT RUSSIAN FAIR

In 1817 Nijni Novgorod became established as the fair town, prior to that date, right into antiquity, various places on the Volga alternated as the fair centre from year to year for the trade of the Russian merchants with visiting merchants from the east The prices fixed at the fair determined the output of important commodities like textiles and tea After being suspended during the World War, and restarted in 1923, it was again abolished by the Soviet in 1930 Nijni Novgorod is now called Gorki

persons from all parts of Asia and Eastern Europe The Leipzig trade fairs sometimes draw 250,000 people

The first trade fair to be held in Great Britain was in 1915, when the Board of Trade organized one on a small scale with the object of attracting some of the buyers who had previously attended the Leipzig Fair Now the British Industries Fair, as it is called, is an annual event and has grown enormously It is held in two sections, that for ordinary light manufactures in London and that for machinery and heavy industries at Birmingham The attendance at the two sections in 1937 numbered over 300,000

In the Orient the great fairs are held at the same time as religious ceremonies Thousands of pilgrims gather each year at Mecca, the Holy City in the hills, 45 miles from the Red Sea, a natural centre of the desert caravan routes There, merchants and desert traders meet in the sacred mart to exchange gems, precious oils, hides and drugs India's largest annual fair is held at Hardwar, on the Ganges

**Fairy.** "Do you believe in fairies?" asks Peter Pan of the audience towards the close of Barrie's ever popular play, and so real do the fairies seem that for the moment we all believe in them We need not wonder, then, that



people of earlier times, who did not have science to explain the strange and wonderful things of the world, felt so certain of their existence

Fairies were supposed to be of almost any size or appearance, and many of them had the power to transform themselves into the shapes of animals. Most often imagination pictured them with the form of human beings, but very, very small—"a few inches high, airy and almost transparent in body, so delicate in their form that a dew-drop, when they chance to dance on it, trembles, indeed, but never breaks."

Related to the fairies are the *gnomes*, or *lobolds*, ugly little creatures who live underground and guard the earth's stores of jewels and precious metals, the frolicsome *elves*, the *brownies*, who love mischief, but will perform many helpful tasks for the family that is kind to them, the *helpies* and *nixies*, who are water fairies and lure men to their death in the depths of beautiful streams, and the *trolls*, who are familiar and friendly, but often mischievous, dwarfs. There are good fairies and bad fairies, but most of these little people are kind to those who do right and who are good to them, and punish those who are wicked or who offend them. Many beautiful and fanciful fairy tales come from Ireland, while those of the brothers Grimm, of Germany, and of Hans Andersen, of Denmark, have delighted many generations of British children.

**Fairy-ring.** Country children, at least, all know the "fairy-rings," where the grass of a field grows suddenly very dark and strong and luxuriant—often in a complete ring, sometimes only in an irregular and broken

one. In these rings, so the country people believe, the fairies dance in the night, and it is as their dancing floors that the rings are said to have been made. But the scientist provides us with a very different explanation.

Fairy-rings are, in fact, the product of certain types of fungus, especially species of the genus *Agaricus* (see Fungi), including the common mushroom. When one of these fungi is ripe, it sheds spores all round itself, in a more or less regular circle. Now in the place where the fungus has already grown the soil is impoverished and unsuitable for further growth, only those spores falling round the outside of this space, therefore, will grow to produce new fungi. These, again, spread their spores, and again only those towards the outside will flourish. But meanwhile the old fungi are dying down, within the new ring of spores, and with their death the soil is for a time enriched, and the grass grows more vigorously than before—especially where the old fungi have died most recently, that is, near the edge.

**Falconry.** One of the oldest and most universal of all sports, falconry demands ideal co-operation of Man and bird. This is difficult to achieve because the training of hawks requires great patience, and cannot be considered successful until complete understanding and confidence between the falconer and his hawk is established.

The hawk may be taken from the nest before it has learned to fly, when it is called an *eyess*, or *eyas*, or it may be trapped full-grown and tamed. It is then called a *haggard*, or *blue*



A FAIRY-RING—BUT MADE BY TOADSTOOLS

The way in which 'fairy-rings' are formed is described in this page, and although you may never see so perfect a specimen as this, complete with its toadstools growing in the grass, this picture gives you a good idea of what does happen under favourable circumstances. You can see how the grass is richest just inside the ring of fungi, where there is plenty of decaying matter, and poorest in the centre of the ring itself, where the soil is exhausted.



*hawk* A hood is used in taming to cover the falcon's head and a *brail*, or strip of leather, is slipped over the wings to prevent fluttering *Jesses*, or strips of light leather with bells attached, are fitted to the legs. A leash is fastened to the jesses. The bird is kept in a dark room and, through feeding from the fist, is gradually accustomed to the hand and voice of the trainer.

Two classes of birds are used in hawking—long-winged hawks, or true falcons, and short-winged hawks. The true falcons include the gerfalcon, peregrine, hobby and merlin. The only short-winged hawks used to any extent are the goshawk and sparrow-hawk. Besides these, others have been trained with success, including even the golden eagle and the buzzard. Among certain peoples other species are also used. Some falcons, such as the peregrine, kill their prey by "stooping" from a great height, where they have been "waiting on"; a blow of the foot is used. Others, like the merlin, will hunt down birds by sheer speed, following every turn as the victim flies. In some foreign countries animals, even quite large ones, are hunted with falcons of various kinds.

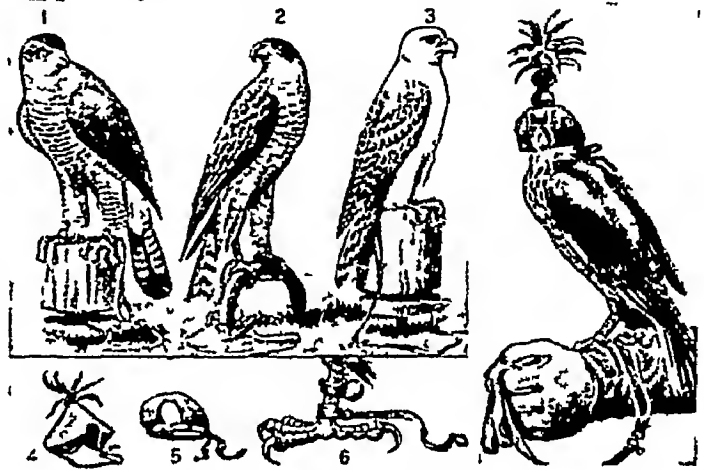
The sport has a language all its own. The prey is called the *quarry*. Striking the quarry in mid-air and clinging to it is *baiting* when game is large, or *trussing* when it is small. The *lure*, frequently a stuffed body of the quarry, is used to win the bird back after it has been freed. Fighting is *crabbing*, and flying away with the quarry is technically known as *carrying*.

**Falkland Islands.** Three hundred miles east of Magellan Strait, near the tip of South America, lie the Falkland Islands—low, rocky, treeless, swept by fierce winds and pelted for three-fourths of the year by cold, drizzling rains. The full force of the South Atlantic Ocean hammers their ragged coastline, with its roaring breakers.

Of the hundred or more islands in the group, only two are important—East Falkland and West Falkland, the former having an area of 2,580 square miles, and the latter an area of 2,038 square miles. The population of the two islands is about 2,500. On the eastern island, on the shores of a landlocked harbour, is the capital, Stanley (population, 1,200), the southernmost outpost of the British imperial government. From here are administered the affairs of the whaling colony of South Georgia, 900 miles east by south, and of the South Shetlands, South Orkneys and Graham Land, far to the south in the Antarctic Ocean. These lands form Dependencies of the Falklands.

Forbidding as they are in appearance, the Falkland Islands form a highly prosperous colony. Large flocks of sheep thrive, there being nearly 3,000,000 acres of pasturage, while whaling yields considerable profits. Every few weeks steamers call from England, and there is cable connexion with Montevideo, Uruguay. Stanley has a good anchorage.

Discovered in 1592, the islands were owned first by France, then by Spain, and finally were acquired by Great Britain in 1771. On December 8, 1914, a squadron of German warships under Admiral von Spee was overtaken and destroyed off the Falkland Islands by a British squadron under Admiral Sturdee.



FALCONS AND FALCONRY

This illustration shows types of hawks and falcons used in falconry and some of the equipment. 1, Goshawk. 2, Sparrow-hawk. 3, Iceland gerfalcon. 4, Italian hood. 5, Ruffier hood. 6, Claw with jess and bell. 7, Peregrine falcon with Dutch hood, bells and jesses.

**Family AND TRIBAL LIFE** Did the first human beings live together in groups as families, banded together for protection, or did they pursue individual paths as if afraid of other society? This question has occupied the curiosity of many great minds. A famous novelist once wrote a story in which he pictured the earliest people living in small groups. At the head was a powerful male. With him were his wives, his daughters and his younger sons. But when these boys grew up they were driven away by the father. If they were sly or strong enough, they began to steal women from other groups, and thus built up bands of their own. In this story early Man differed little from the animals which he hunted.

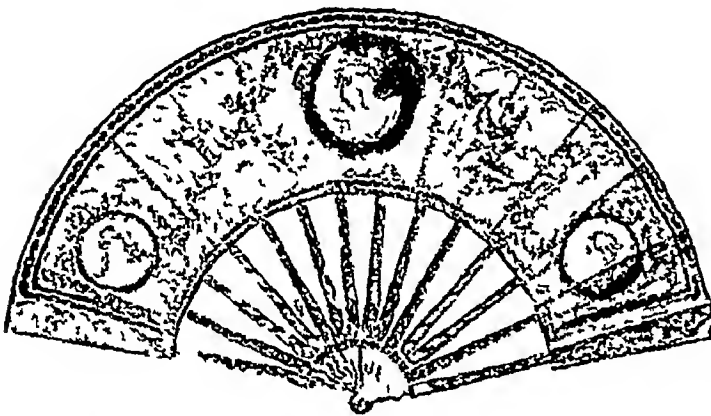
But other writers believe that at first there was no family at all. Young children remained with their mothers until old enough to take care of themselves, then became independent members of the human herd. As Man began to fashion tools, the idea of property developed. Children living with their mothers would take possession of her belongings when she died.

They would come to know her sisters and associates, and with them would form a group, the members of which would consider themselves related. According to these writers, if a man from outside sought a mate in this group he would be accepted only as a visitor, and his children would remain with the mother. Since they would have no contacts with the father's family, they would not think of them as relatives, and hence would not claim a share in their property. Thus, in time, a group would be established in which the children would inherit property through their mother and would consider all the members of her group as relatives. Anthropologists call such a group a clan.

The upholders of this theory believe that at one time the women were so important that they were actually the heads or rulers of the clans. Such a society, in which women rule, is called a matriarchy, a term formed by combining two Greek words meaning "mother" and "rule."

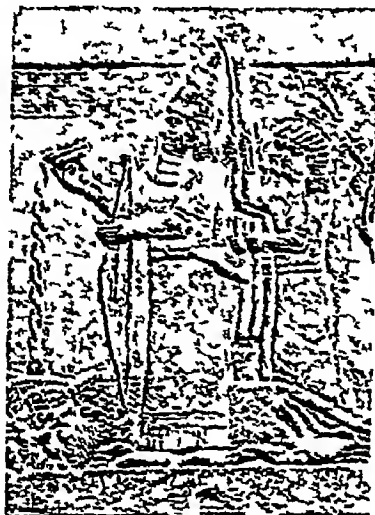
With the increase of population and wealth the man began to be more important, and mother rule slowly changed to father-rule, or patriarchy. As protector of his group and of his flocks, the man became a warrior, while household duties and the raising of crops fell to the woman. If the man had considerable property, he needed additional women to manage the camp, so he married more. The marriage of a man to more than one woman is known as polygamy, or polygyny; polygamy really means "much married", polygyny means "many women". Sometimes warfare between the groups, or the loss of a band of hunters, would result in a shortage of men, and lead to polygamy.

There are many other theories concerning the development of the family and of society, but these examples will show that the form of family organization has not always been the same as it is with us today, when the word family, as it is generally used, covers at least father, mother and their children.



#### AN ANTIQUE FAN

Many of the fans carried by ladies in former times were painted by famous artists. Above is a silk fan of the 18th century with medallions by F. Boucher.



#### FANS FOR USE AND CEREMONIAL

The illustration on left shows a standard centrifugal fan such as is used in modern ventilating plants. On the right a ceremonial fan is seen in use in this part of an Assyrian frieze showing King Ashurbanipal during a hunting expedition with, behind him, his two fan bearers. Such fans were made of feathers attached to long handles. Fans of one kind or another have been in use for many thousands of years.

**Fan.** Although you seldom see a fan used in public now, at least on normal occasions, there was a time when every lady not merely carried a fan, but was continually fanning herself, and the art of using a fan was one of the first in which she had to be accomplished. In the East, especially, fans have been used from the earliest times, as we can see from Egyptian, Chinese, and Indian art, and the fans of China and Japan are world-famous. It is thought that the fan originated in China at least as early as 3,000 B.C., and it survives, unchanged in many respects, to the present day. The early fans, however, in all countries were of fixed type, consisting of a "mount," the blade part of the fan, attached to a handle; these are called screen fans. But the fan you will usually see in England is of the folding type, which is of later original date, and which came in the first place from Japan, reaching Europe through the Portuguese traders of the 16th century. The fan in Japan is more than a useful or ornamental article, for it has great symbolic importance; it represents, in fact, nothing less than an emblem of life, this being seen in the radiation of the sticks from their single rivet when the mount is opened.

The art of fan-painting is one which, with the passing of the fan's general popularity, is now almost dead in England, but during the 18th and 19th centuries especially it flourished. Many great artists devoted time to

this art, working usually on parchment, on paper or on silk, while one or two made a speciality of it above all other branches. Among these was Charles Conder (1868-1900), whose work, done usually in the finest of pastel tints, brought him a wide reputation. So lovely are many of these fine fan mounts that you may see them framed as pictures instead of used for their original purpose, when their beauties would be hidden for much of the time and they might well be damaged.

The use of the fan, from the great screen fan of palm leaves or feathers, handled by a slave in olden times, to the most perfect example of the artist's work from Japan, has always been to keep the owner cool by agitating the surrounding air. But when the carrying of fans has become, as in modern Europe, a mere fashion, this use is lost sight of. Moreover, there is really no need for fans of this type, since electric fans are now part of the equipment of most public places, shops, restaurants, etc. These fans though unromantic, are none the less essential in many parts of the world. Mechanical fans, too, are used for other purposes, as, for instance, in the winnowing of chaff from grain—one of the earliest uses of large fans—and in creating suction for withdrawing dust and light rubbish from factories and buildings.

Another type of "fan" with whom you will be familiar is the football or film "fan"—you may even be one yourself. How the word became used in this connexion is not clear. It may either refer to the fact that the "fan" encourages the footballer, "fanning" him to further efforts, or it may be abbreviated from the word "fanatic," and thus refer to the person who is "mad about" the subject—or person—under discussion.

**Fancy Dress.** This term is applied to any fantastic or picturesque costume which is worn at a carnival, masquerade or carnival dance. The fantastic variety may include topical costumes, based on a clever cartoon or caricature, a popular play or a book title or advertisement, such topical ideas usually appeal more to men than women.

Picturesque costumes may be chosen from different historical period costumes. When choosing period costumes, attention must be

paid to small details, such as particular modes of hairdressing, styles of footwear, jewelry, headgear, etc. Also detail must be noted of anything carried in the period, as fans, sticks, musical instruments.

Whatever costume is chosen it should suit the wearer, and some thought should be given to comfort if it is to be worn for several hours. Many successful costumes can be devised by copying those seen in paintings, drawings and china figures (such as Dresden china shepherds and shepherdesses).

The materials used for fancy dress need not be expensive to be effective, casement cloth,

chintz, cretonne, sateen and muslin are all very effective for period costumes, and can be handled easily in making up styles. Sateen and casement cloth form a useful foundation for the majority of non period styles, such as those representing the seasons, and for topical, pierrot, and harlequinade costumes. For the last-mentioned, inexpensive materials are obtainable with the correct designs and colourings.

For the jewelry, a hunt through an old family trinket box will often reveal just the right piece to suit an old-fashioned costume, or a careful selection from the sixpenny stores will provide the necessary show of brilliance which a period style demands.

Wigs may form an important part in quaint costumes. They are best and coolest when made on a foundation

of embroidery canvas, shaped to fit the head. Tissue paper and crepe paper cut into strips can easily be made into curls by drawing a fine bone paper knife, or the backs of scissor-blades, along their length, the curls can then be sewn to the foundation. Tissue paper can also be cut in lengths like a cake frill, and sewn to the foundation with good effect. Knitting wool and silk left in loops, or the loops cut and frayed, also make effective wigs when attached to a foundation.

**Faraday, MICHAEL** (1791-1867) Sir Humphry Davy was once asked what he considered his greatest discovery. "Michael Faraday" was his answer. And well might this be, for almost all the developments of electricity with which we are now familiar were either foreseen or actually begun by Faraday. Unlike Edison (q.v.) Faraday was the complete scientist, unmundful of the commercial application

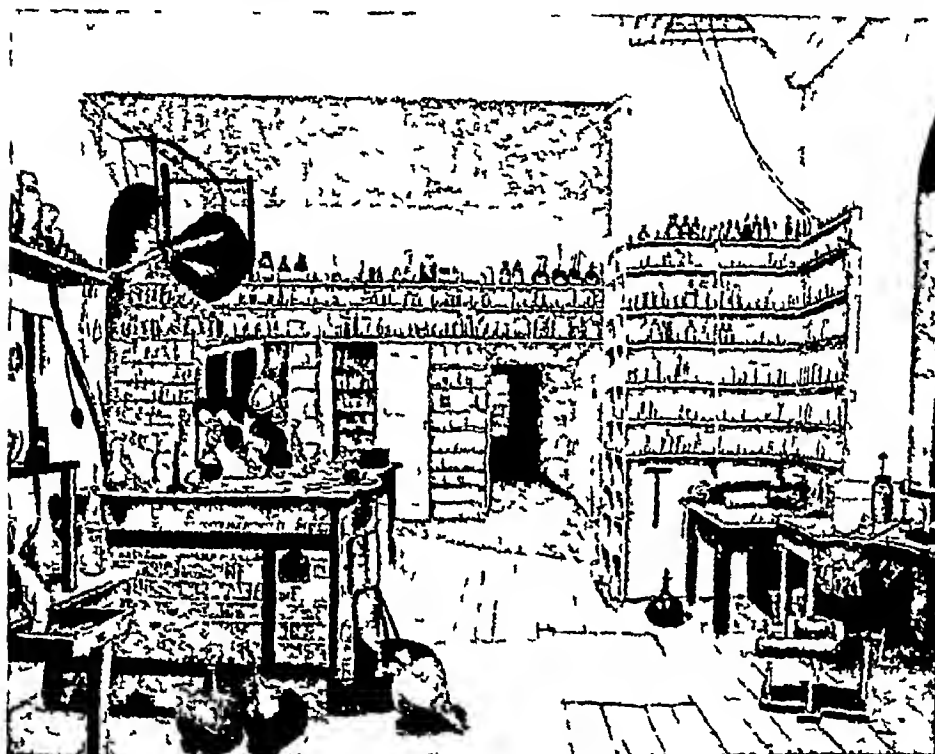


**MICHAEL FARADAY**

Faraday was one of the great pioneers of electrical science. Working with primitive apparatus and with no scientific training, he made discoveries that laid the foundations of the vast modern industry of electrical engineering.

of his inventions so long as he unravelled more of Nature's secrets. He is the universally recognized "father" of modern electrical science. His discovery of the induction of electric currents became the basis for the generation of all electric power by the dynamo. Indeed, all the forms of electric power now in world use are ultimately due to Faraday. His discoveries made greater changes in the fabric of civilization than any other, with the possible exception of the petrol engine. The electro-magnetic unit of capacity, the farad, is named after him.

Michael Faraday was born at Newington Butts, London, September 22, 1791, the son of a Yorkshire blacksmith who had settled in



FARADAY AT WORK IN HIS LABORATORY

Many striking hypotheses enunciated by Faraday have since been verified, and the work of this brilliant investigator has suggested lines and methods of further experiment which might never have been possible without his inspiration. In 1903 the Faraday Society was founded in his honour, and among its presidents have been such world-famous men of science as Lord Kelvin and Sir Oliver Lodge. This picture is from a contemporary source.

London. When only 22 he became laboratory assistant at the Royal Institution. As assistant to Sir Humphry Davy he accompanied that great chemist on a tour of the Continent, 1813-1815, and on his return resumed his work at the Royal Institution. At this time he was devoting himself entirely to chemical research, working chiefly on carbon compounds. Later he turned his attention to the liquefaction of gases, and to researches on the alloys of steel and on optical glass. One of his specimens of heavy glass was used in his great experiments on the polarization of light.

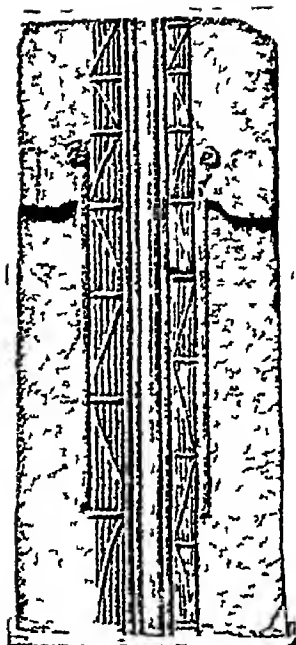
As early as 1812 Faraday had busied himself with the problem of electricity, and in that year he had made his first battery—a voltaic pile consisting of seven half-pennies, seven pieces of zinc and six pieces of paper moistened with salt water. Early in September, 1821, he began his experiments on electro-magnetism, and by securing continuous rotation of both conducting wire and magnet he solved a problem which had long puzzled physicists. Ten years later, on August 29, 1831, he arrived at his greatest discovery, the induction of electric currents, and on October 28 he made the first dynamo. In 1833 he proved the identity of electricity from different sources, in 1834 came the discovery of equivalents in electro-chemical decomposition, in 1838 of electrostatic induction, followed by the announcement of the relation between electric and magnetic forces.

His second great period of discovery began in 1845, when he returned with success to a problem that had long exercised his mind—the effect of a magnetic or electric field on transparent bodies. In November, he announced the magnetization of light, and at Christmas the discovery of diamagnetism.

Faraday published his "Experimental Researches in Electricity" from 1841 to 1855, and his "Experimental Researches in Chemistry and Physics" appeared in 1859. All his researches were carried out at the laboratory of the Royal Institution. He had

been made director in 1825 and Fullerman professor in 1833, but his unwillingness to undertake what he termed "commercial work" might have led to financial straits had he not been given a pension in 1835 and a house at Hampton Court. He died there, August 25, 1867.

**Fascism.** (Pron fash'-izm or fas'izm) In October, 1922, a great host of black-shirted young men converged on Rome from all parts of Italy. Though they were demanding radical changes in the political and economic structure of the State, there was no resistance to their onslaught. The Prime Minister resigned and



### ROMAN FASCES

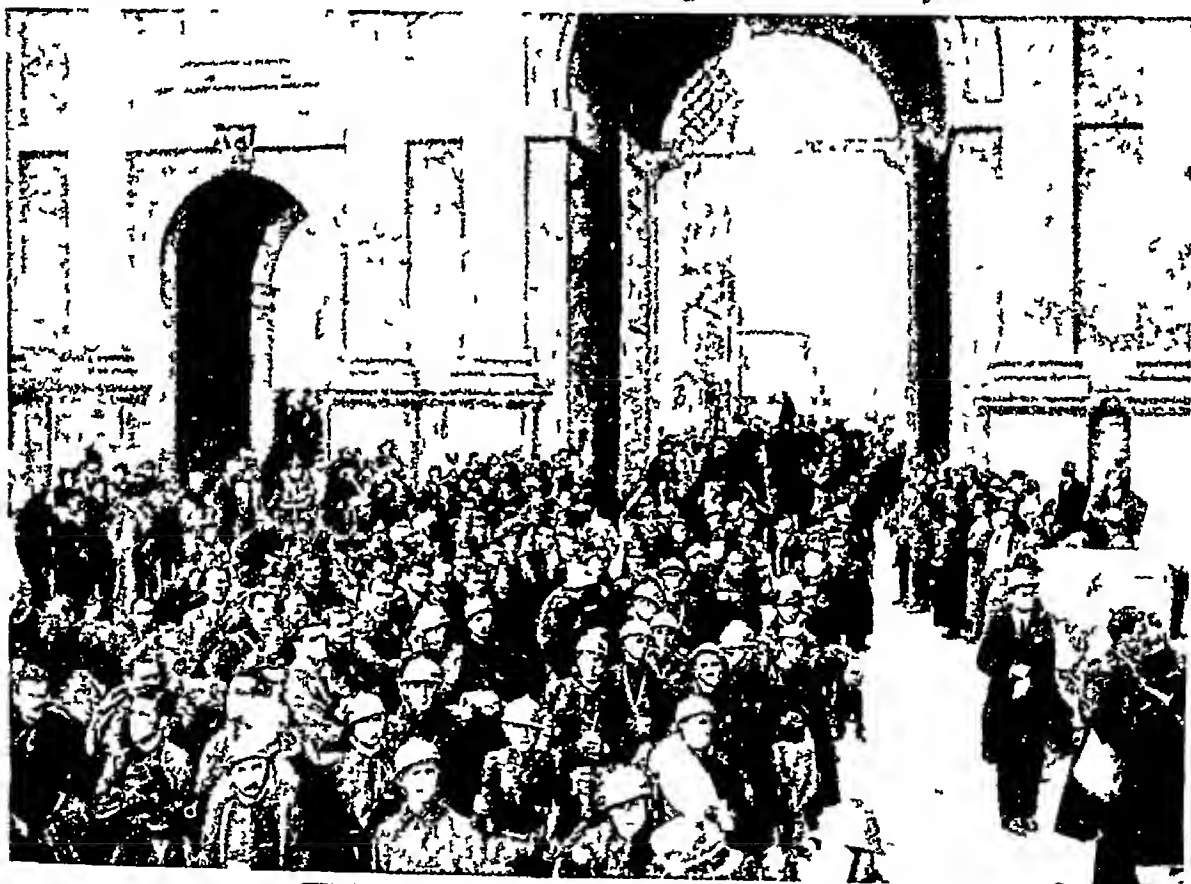
This stone relief of two fasces conveys an idea of how the bundles of rods were bound together. The strands also held the axe.

their leader, Benito Mussolini, who was then only 39, took his place. So was accomplished the first stage in the Fascist Revolution.

The word Fascist is an echo of Ancient Rome. Fasces were the bundles of rods, with an axe emerging from their midst, which were borne by the lictors (police officers) before the chief magistrates as symbols of their authority over life and limb. The term was revived by Mussolini, no doubt as emblematic of that order and unity which he had pledged himself to re-create.

Italy at that time was in a very bad way. Although she had emerged from the World War on the winning side she was deeply disappointed with the terms of the Peace Treaty, for the new territory and share of reparations that she received did not, in the opinion of most Italians, compensate her for the losses and sufferings she had undergone. For a short time the forces of discontent were marshalled by the Socialists, but when they proved quite incapable of rebuilding the much damaged fabric of society, they were countered by a new body of enthusiastic young men who had gathered round the dynamic personality of Mussolini, a one-time Socialist editor who had become a fervid patriot during the war years.

To an Italy in which industry was crippled by strikes, in which poverty and unemployment were rampant, and with a government riddled with corruption and incompetence, Mussolini held out a vision of disciplined progress. Where everything was in confusion it was no wonder that great numbers of all classes rallied to his banner. The first *fascio di combattimento* ("battle unit") was founded on March 23, 1919, and was composed very largely of ex-service-men. During the next two years the Fascists—

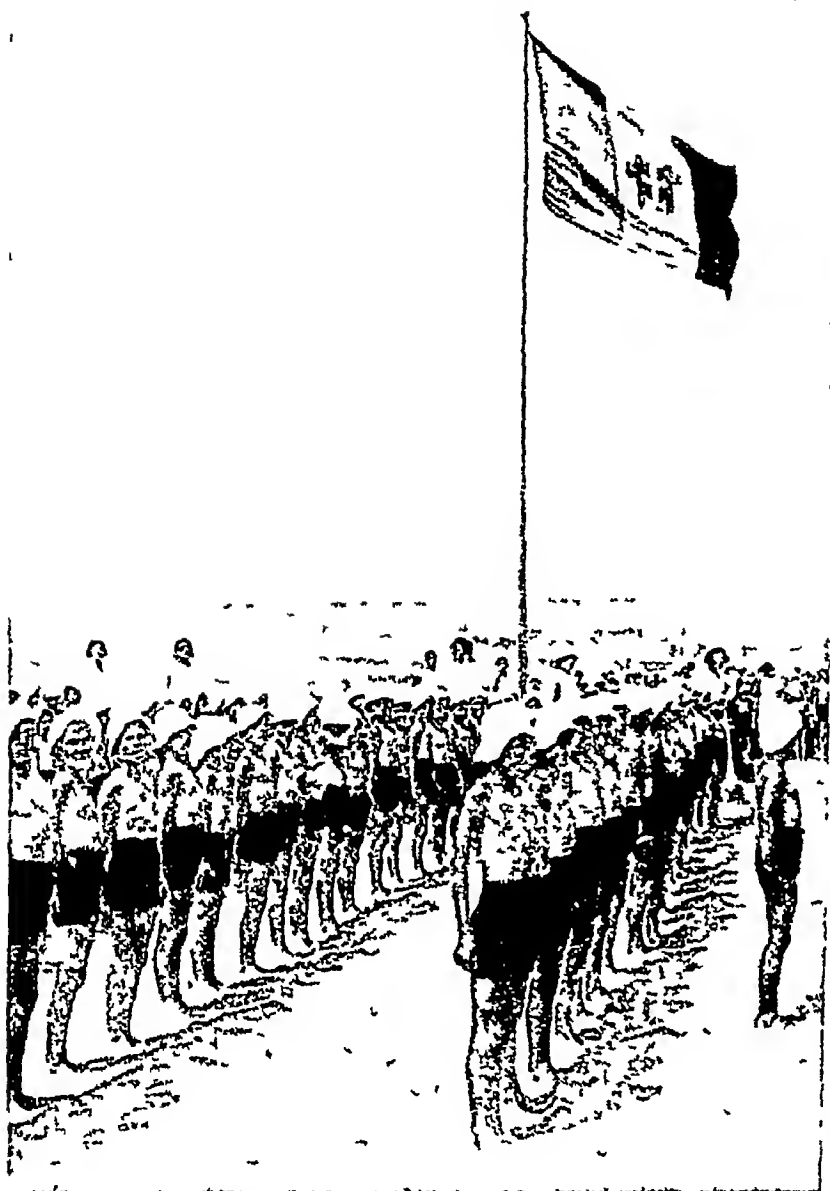


### THE MARCH OF THE FASCISTS ON ROME

E.N.A.

Mussolini's spectacular success in achieving almost overnight the position of 'Il Duce,' Dictator of all Italy, had careful organization behind it. The people had already begun to listen in real earnest to the Fascist teaching, and thus encouraged Mussolini to declare: 'Either the Government will be given to us or we shall seize it by marching on Rome.' His Blackshirts concentrated on the capital, and they occupied it on October 30. Here some of them are seen entering Rome.





#### FASCIST SCHOOLCHILDREN IN CAMP

Camps for Fascist schoolchildren are a regular feature in Italy. Here are some members of a huge camp of 50,000 enjoying a holiday on the outskirts of Rome. They are singing 'Salutation to the Flag'. In these camps the youth of the country are initiated into Fascist ideas and prepared for military service.

prominent figures in the black shirts which had been adopted as their distinguishing mark—were engaged in a furious struggle with the Socialists and Communists. The streets of the great Italian cities became battle grounds, and in the use of the revolver, the bludgeon, and compulsory doses of castor oil the Fascist forces soon demonstrated a marked superiority.

In May, 1921, Mussolini and 32 other Fascists were elected to Parliament, and eighteen months later, when Parliament had earned still further the disgust of the majority of the people, Mussolini ordered the march on Rome.

That was but the beginning of the Fascist Revolution, however, and the real work has been accomplished since. However much the

methods of Mussolini and his henchmen may be criticized, there can be no doubt that it is largely owing to him that Italy now enjoys a "place in the sun." Parliament has been converted into the sounding board of dictatorial opinion, and is doomed to disappear completely. All parties other than the Fascist Party have been suppressed. All opinion, whether expressed in newspapers or on the platform, has been rigidly regimented, and even little boys of six are compulsorily enrolled in the service of the State—a service which ends only when the age of 55 is reached. Democracy has been trampled in the mud. In its place we have the conception of the Totalitarian State, in which everybody and everything is forced to submit to what is regarded as being in the interests of the State. Under Fascism the individual counts for nothing, except in so far as he is a unit in the life of the State. He has no rights opposed to the State's will. His freedom of action, his property, his very life are privileges enjoyed solely through the power of the State, and the State may demand them from him again.

At the head of the Fascist State is the Dictator—*il Duce* (the leader), Signor Mussolini. He is in supreme control, his every word is law and must be obeyed. Though there is

still a king in Italy, he is but a figure head.

Of late years a body of Fascist theory has developed, and this includes the conception of the "Corporative State," in which all the country's industries and professions are grouped into 22 Corporations, whose affairs are directed by nominated representatives. These Corporations, it is intended, shall be the recruiting grounds of future M.P.s, so that Italians will be represented, not on a geographical basis, as in Britain, but on a "functional" one. Thus doctors, lawyers and artists will be represented as members of their Corporation and not according to their place of residence.

Mussolini once declared that "Fascism is not for export," but since his triumph in Italy other



## FASCISM

dictators (*qv*) have striven to emulate his success. Thus we see Herr Hitler (*qv*), capturing the Nazi movement in Germany, Kemal Ataturk in Turkey, Dr Salazar in Portugal, Dr Schuschnigg in Austria, and so on.

**Fates.** Human destiny, according to the ancient Greeks and Romans, was controlled by three Fates. The Greeks called them Moirai, the Romans Parcae. Their individual names were Clotho, the spinner of the thread of life, Lachesis, who mixed good and evil fortune with it, and Atropos, who cut the thread. In art they were represented thus. Clotho, with a distaff or a roll (the book of fate), Lachesis, pointing with a staff to the globe, Atropos, with a pair of shears or scales.

**Fats AND OILS.** Few classes of substances are so important as these, both as food and for industrial purposes. As human fuel, they produce more than twice as much energy as any other sort of food, while in industry their uses are without number.

Fats and oils consist chiefly or entirely of carbon, hydrogen, and oxygen. They all burn readily and do not dissolve in water, but melt more or less in alcohol or ether.

According to their origin oils are classified as animal, vegetable, and mineral. Mineral oils, of which petroleum is the chief, are obtained from the rocky structure of the earth, but they are of primeval vegetable origin, having been formed from prehistoric plants buried far below the surface of the earth. The name "mineral oils" is retained, however, for convenience. (See Oil)

There is no sharp distinction between fats and oils, since the chemical composition of both is similar. For practical purposes we apply the term fats to substances that are solid at

67° F, and oils to those which become liquid at that temperature.

We also distinguish between "essential," or "volatile," oils, which evaporate rapidly and do not leave a permanent grease spot on paper, and "fixed" oils and fats, which leave permanent marks. The essential oils are all obtained from plants, possessing in highly concentrated form the odours of the plants from which they come, and are largely used for perfumes, flavourings, and in medicine.

The fixed oils and fats are of both vegetable and animal origin. Butter, lard, tallow, neat's



## IMPORTANT SOURCES OF OILS AND FATS

The central picture shows some sources of animal fats and oils. Cows, yielding butter, sheep (tallow), pigs (lard), whales (sperm oil), codfish (cod-liver oil). Outside the circle are the chief plants that give vegetable oils. 1, Pine (turpentine). 2 and 3, Orange and lemon (oil for perfumery). 4, Peppermint. 5, Clove (medicinal oil). 6, Citron (oil for flavouring). 7 and 9, Eucalyptus flower and tree (medicinal oil). 8, Coconut (oil). 10, Olive (oil for food and medicine). 11, Cotton-seed (oil for soap). 12, Flax (linseed oil). 13, Castor Bean (castor oil). 14, Almond (oil for medicine and perfume). 15, Poppy (oil used for the manufacture of fine pigments).

foot oil, various fish oils and whale oil are among the common animal oils. Lard, the most important of the fats with the exception of butter, is the melted and purified fat of pigs. Tallow is melted sheep- or cattle-fat, and is sometimes used in making margarine. Inferior grades of fats and oils are among the most important of the materials used in the soap-making industry. (See Margarine, Soap)

#### Plants that Provide Oil

Vegetable oils come from a great many kinds of plant and fruit products. Chief among these are the olive, cotton-seed, linseed, soya bean, almond, coconut, castor bean and poppy seed oils. Most of these are obtained by pressing the seeds or fruit in specially built presses, while most of the animal oils are "rendered," that is, extracted by heating in steam or water, usually under pressure.

Those oils that have the property of rapidly taking up oxygen when exposed to the air and drying with a tough elastic surface are called "drying oils." They are of great importance in making paints and varnishes. Linseed oil, made from crushed flax seed, is of great importance in oil painting, in the paint and varnish industry, and in making oilcloth and linoleum.

Non drying oils take up oxygen much less readily and do not harden like the drying oils, but gradually decompose and become rank-smelling when exposed to the air, olive oil is an example. These oils are chiefly used as food and in soap manufacture. The most important after olive oil is cotton-seed oil, although soya bean oil is of increasing importance.

Coconut oil is important both as a food and in making soap and medicinal and toilet preparations. Castor oil, which is made from the castor bean, comes chiefly from India. It is valuable in making fine lubricants, soap and sticky fly-paper, and in medicine. It is also important as a lubricant for petrol engines.

When the oils are pressed from cotton, flax and other seeds, the hulls are left in the form of hard oily cakes called oil-cake, which is ground into meal and used both as a foodstuff for animals and as a fertilizer. Cotton seed meal, linseed meal and castor-pomace are all exceedingly useful for both these purposes.

**Faust.** (Pron foust) In the 16th century there sprang up, first in Germany and later in other countries in Europe, various tales of a magician, Dr Johann Faust, who was in league with the devil, performed marvels with the aid of the evil one, and practised the black art.

There seems to be little doubt that a personage of this name really existed, but the facts of his life have been lost amid the legends which have gathered about him. He was represented as a charlatan who travelled from place to place in Germany, living by his wits, and claiming to be a

physician, alchemist, astrologer and magician. The numerous stories popularly attached to his name were collected by an unknown compiler and published at Frankfurt in 1587 as "The History of Dr Johann Faust." It relates how he sought to acquire supernatural knowledge and power by a compact with Satan. This pact, signed with the blood of Faust, set forth that Mephistopheles, a devil, was to become his servant for a period of twenty four years, at the end of which Faust agreed to give himself up to Satan.

Mephistopheles entertained his master with high living, long discussions on the relation of the devil towards God, the nature of heaven and hell, etc., and with glimpses of the spirit world. At the end of the twenty four years Faust was carried off by the devil.

The story gained wide popularity and was used as a theme by many writers. It became the subject of a great drama in verse, "The Tragical History of Doctor Faustus," by Christopher Marlowe, the father of English tragedy (1604). Gradually the Faust legend degenerated into puppet-plays and Punch and Judy shows, until Goethe, at the opening of the 19th century, raised it to quite another level.

There gradually crept into the legend the shadowy figure of a beautiful young German girl, Gretchen, a daughter of the common people, with whom Faust fell desperately in love. This element of the story grew and grew in importance, until in the hands of Goethe it blossomed into the episode of Margaret, whose betrayal by Faust is one of the dominant notes in Goethe's poetic tragedy "Faust." Contrary to the early versions, Mephistopheles fails to absorb Faust completely in the pleasures he provides—one of the conditions of the compact in Goethe's poem—and the result is the ultimate salvation of the magician. Gounod's opera "Faust," was adapted from Goethe's tragedy.

**Fawkes, Guy, or Guido** (1570-1606) For more than 300 years the Fifth of November has been celebrated in England by the burning of stuffed figures ("guys") of this Gunpowder Plot conspirator, and children used to sing

Please to remember the Fifth of November,  
Gunpowder treason and plot!  
I see no reason why Gunpowder treason  
Should ever be forgot.

This old custom keeps alive the horror felt by England in 1605 when Guy Fawkes and his fellow conspirators, because of the penal laws against Catholics, tried to blow up King James I and Parliament. They succeeded in storing several barrels of gunpowder in a cellar under the Houses of Parliament, but before Parliament opened, on November 5, the plot was discovered. Sentence of death was passed on all the conspirators, Fawkes being executed, Jan 31, 1606.

Fawkes was born at York, April 16, 1570, of a good Yorkshire family. His parents were Protestants, but his stepfather, if not a Catholic himself, was connected with many great Catholic families, and Guy early became a Catholic. He served for some years in the Spanish armies in Flanders. He was approached by the main conspirators in the plot in 1604, and was entrusted with its actual execution, having been in charge of the elaborate preparations from December, 1604, to May, 1605.

**Feathers.** These are the characteristic covering of birds. Each feather arises from a nipple at the bottom of a pit in the skin that begins to form long before the embryo is hatched. Around this nipple there forms a cap of secreted horny material that presently becomes loosened

and is pushed up by another cap forming beneath it. Thus a tube results, which is the shaft or "quill" of the feather, and in which the succession of caps may usually be seen. When the full size is reached the process ceases, the root end

of the quill closes, and the feather is pushed out at moulting time by new growth.

The plumage is preceded in the nestling by one or more coats of small immature feathers ("down"), which are successively shed and replaced until the final mature coat is obtained. The mature feathers become worn and torn, and once, or in some cases twice, a year are moulted, and replaced by a new growth from the same sources. These moults may result in differences in colour and form according to the season in which they take place.

#### The 'Quill' and the 'Vane'

A feather consists of two parts, the quill and its horizontally branching growths that form the "vane" in various shapes. Sometimes these branches are disconnected, or nearly so, as in downs and in ostrich plumes, but ordinarily they carry branchlets, or "barbs," that hook together at their adjacent tips in a firm but elastic web, especially strong in the case of the large "flight feathers" of the wings and tail.

The vane may be nearly or quite absent from some feathers, or it may become solidified into scales, as in penguins. These variations in delicate structure are unlimited, and, together with its capacity for colour, make a feather one of the most beautiful things found in Nature.



LAST FIGHT OF GUY FAWKES'S FELLOW CONSPIRATORS

Though Guy Fawkes was arrested as soon as his plot was discovered, some of the Gunpowder Plot conspirators fled with Catesby to Warwickshire and endeavoured to rally the countryside to their cause. Their efforts were unsuccessful, and they took refuge at Hewell Grange. Pursuers were hot on their track, and, on November 8, 1605 the sheriff and his officers found their hiding-place. The small band put up a last fight as depicted in this picture by Ernest Crofts, R.A. The top illustration from an engraving in the National Portrait Gallery shows Guy Fawkes and two of his fellow conspirators.

## FEATHERS

The colour of feathers may be due to contained pigments, but the brighter hues, such as the iridescence of a peacock feather, result from mechanical conditions. The pigments are apparently waste products of the blood, and consist of black, red, yellow, and in some cases of a red or a green peculiar to certain families of birds.

Feathers are a warm covering. In this fact, perhaps, lies the secret of the survival of the developing class of birds in the constantly cooling and drying climate that killed off the big leather-



hided or scaly reptiles of the late Mesozoic days from which the class arose.

Man has taken advantage of this knowledge, and uses the down of the goose and eider duck for bedding and upholstery. Ostriches are reared for their plumes in South and North Africa, Argentina and the United States of America. Fishermen's flies are made of tiny feathers. Tooth-picks and holders for artists' brushes are fashioned of quills. For centuries feathers have been valued as ornaments to dress. The feather cloaks of Mexico and Hawaii, worn chiefly by royalty, are now

## FENCING

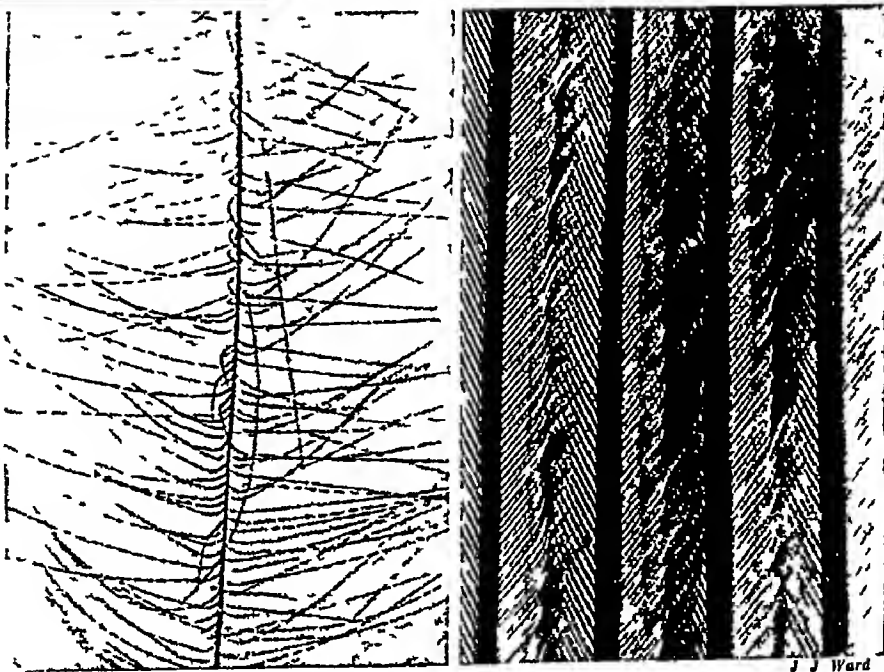
prized as works of art. Savages use bright feathers to decorate their war costumes.

**Felspar.** A group of minerals composed of silicate of aluminium together with potassium, sodium and calcium. There are several varieties, known as soda felspar, lime felspar, potash-felspar, etc., according to the mineral that is most abundant. Most igneous rocks (granite, gneiss, etc.) are made up of crystals of some kind of felspar, associated with some other mineral or minerals, and by the identity of the felspar they contain they are classified.

The potash—and potash-soda—felspars, with in certain limits of temperature, melt without becoming fluid, and on cooling form a strong colourless or very light coloured glass. For this reason they are extensively used in the manufacture of porcelains, serving as a flux to bind together the other materials, clay and flint. Felspar (also spelt "feldspar") is one of the principal ingredients in the glaze for chinaware and tiles, and of opalescent glass.

**Felt.** A fabric formed without weaving, by matting together fibres of hair, wool or fur with the aid of moisture and heat by a process of rolling, beating and pressure. Felt is used for many purposes, such as hats, carriage linings, pianoforte hammers, surgical dressings, etc. In Asiatic countries floor coverings of felt have been made from remote antiquity and are still widely used. (See Cloth)

**Fencing.** Quickness of eye, speed of thought, and swiftness of muscle form the essence of fencing. The fencer faces his opponent



DETAILS OF WINGS AND FEATHERS

The two upper pictures in this page show a chaffinch's wing closed and open. When closed the feathers overlap and take up as little room as possible; when open, they just touch and make an impermeable screen. Below, (highly magnified), on the left, is part of an owl's feather, and on the right a number of barbs interlocking along the edge of the feather.

with every nerve in his body taut, he stands poised with his foil darting in and out like a stab of light. Suddenly he sees his opening, he has only the merest fraction of a second in which to take advantage of it, but he does not fail. With a lightning-like movement of arm and wrist and body he sends his button-tipped foil to his opponent's breast and scores a well earned point.

Fencing is one of the finest exercises in the world. It gives poise, grace, suppleness and strength on the physical side, and judgement, self control, initiative and quickness of thought on the mental side. It includes using the *épée*, *sabre*, and other light weapons, besides the foil, as a means of recreation.

The equipment for fencing with foils includes a tight-fitting padded jacket, a mask made of strong material, a button-tipped foil of flexible steel and a glove that comes well down on the wrist of the fencing arm.

The position that a right-handed fencer takes when "on guard" ready for a "bout" is with his feet well apart, his right arm bent and pointing toward his opponent, the foil held slightly forward, and his left arm lifted so that the hand is about level with the top of his head. When he "lunges" he throws his right foot forward a few inches, bends his knee at right angles and, straightening his foil arm, thrusts his weapon quickly at his adversary, at the same time lowering his left hand to a point within a few inches of his left thigh.

A "feint" is a movement to mislead, a "parry" is the warding off of the opponent's foil. There are eight simple parries, known as *prime*, *seconde*, *tierce*, etc.

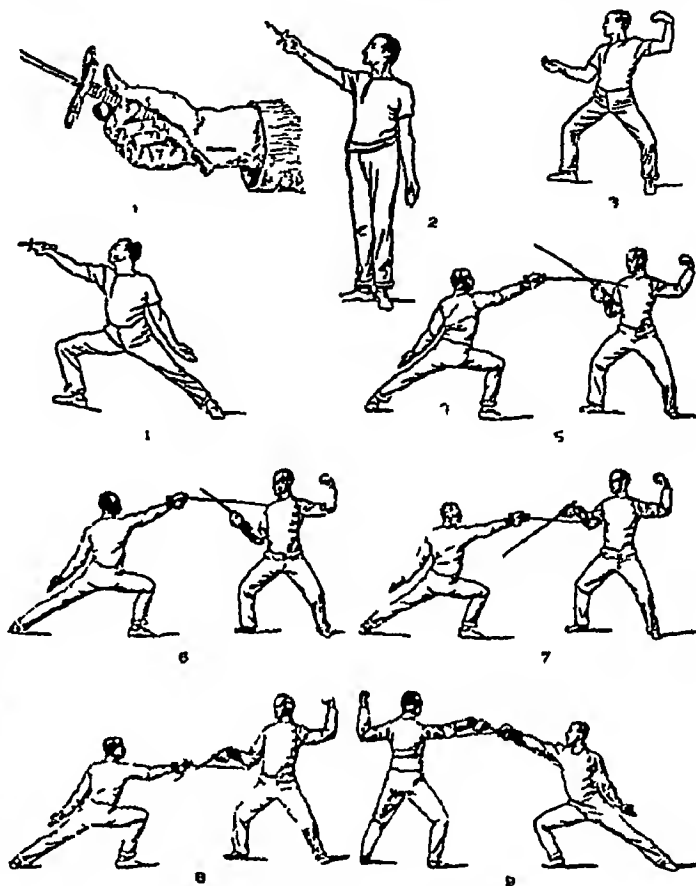
You do not need to be an expert to enjoy fencing, for it is an easy matter to learn simple attacks and parries, and the further one goes in the sport the more fascinating it is, for there is unlimited opportunity to develop skill and what is called *finesse*.

Fencing, as practised today, is, of course, a development of duelling (*qv*), which was carried out with deadly weapons and in no sense on friendly terms. The last duel in England, which resulted in the death of one of the opponents, was fought in 1845.

The history of the sport is interwoven with the history of Mankind, for it started centuries ago in those lawless days when a man's life was not his own unless he could defend himself with the sword.

Henry VIII of England was the first to give fencing a recognized standing as an English sport.

**Fermanagh**, (Pron fer'-ma-na), IRISH Co. The main feature of this county of Northern Ireland is the basin of the Erne, with its two beautiful island studded loughs. Between the latter is Enniskillen (pop 4,000), the county town, whence the Royal Inniskilling Fusiliers derive



FENCING WITH THE FOIL

Above are illustrated some of the chief fencing positions. 1, Hand on foil. 2, Preliminary positions. 3, On guard. 4, Lunge. 5, Parry of quarte. 6, Parry of sixte. 7, Parry of septime. 8, Parry of octave. 9, Riposte from parry of quarte.

their name. The surface of Co. Fermanagh (pop 54,000, area, 650 sq miles) is undulating, and the chief occupations are agricultural.

**Fermentation.** When milk sours or bread rises, when fruit decays, when you digest food, when alcohol is produced in sugary substances, and when that alcohol turns again to vinegar, you have in every case an example of the process called fermentation.

Fermentation is always due directly or indirectly to living organisms, and consists of the breaking up of some substance into simpler forms. Common yeast, for instance, which is only a very simple kind of plant, decomposes sugar into alcohol and carbon dioxide, but this is not caused directly by the yeast but by an "enzyme" produced in the living body of the yeast. Similarly, our own bodies produce enzymes which help to digest our food.



In the case of sour milk, butter and cheese, enzymes derived from certain types of bacteria of vegetable origin produce the lactic and butyric acids that change the quality of the milk (See Alcohol, Bacteria, Yeast)

**Ferns.** Most of the ferns (*Filices*) can be distinguished from other plants by their leaves, popularly known as fronds. These possess a single midrib, with little leaflets branching off from either side, the whole reminding you of a large, heavy, green feather. This is the plan on which most fern fronds are built, though many are constructed somewhat differently.

In most common ferns each frond grows directly from a creeping stem or rootstock under the ground, and so the plant resembles a bunch of large green feathers stuck into the ground. Usually the fronds are a beautiful bright green, though some are a dark shiny blue green, and they are delicately cut into fine toothed or lobed edges. Most ferns live in damp places in woods and many like shade as well as moisture. Yet others can survive on the barest walls and rocks exposed to the hot sun.

Ferns are widely distributed over the world and are of many different habits of growth. Some are but a few inches high. The tree ferns chiefly inhabiting tropical countries, tower upwards forty feet or more, and the crowns or leaf portions are immense clusters of fronds, some of which reach a length of fifteen feet and more. While most ferns grow on the ground, a number are "epiphytes," that is, they live fastened upon the surface of the trunk or branches of trees.

The fern does not grow from seeds as do the higher plants, but from spores. These spores are very minute dust-like grains, each one a single plant cell, produced by one of the fronds of the adult fern, and scattered about by the wind. When a spore falls in a favourable situation it grows into a curious little flat green body known as the "prothallus" (meaning "before the plant"). In the prothallus grow little cases, some containing eggs and others tiny movable bodies called sperms. The sperms are able to swim by means of a little hair-like

projection upon one end of the body, and they swim to the eggs at some time when the prothallus is covered with a thin film of water and fertilize them. From these fertilized eggs grow the large fern plants. So the life history of a fern plant may be summarized thus: Ferns produce spores, spores produce prothalli, in prothalli grow eggs and sperms, sperms fertilize eggs, fertilized eggs grow into large fern plants again. (See Seeds and Spores)

Fern fronds are visible in the spring as hairy brownish-green balls clustered together on the ground. As the season advances they gradually

unroll, until in the later summer the full frond is revealed. In the autumn they turn red, yellow, or brown, and then fall and decay.

The term "bracken" is applied to the massed, single fronds of the tall, coarse, brake fern (*Pteris aquilina*) which grows profusely in open woodland. In some parts of the world this fern is tremendously harmful, since it rapidly takes possession of all suitable country and renders it useless. It is expensive to get rid of and may almost permanently run large areas.

Ferns have little economic use, though the coarse brackens are sometimes used for bedding for animals, and in Hawaiian mattresses are stuffed with ferns called "pulu." The rootstock of a New Zealand species is used for food, and elsewhere bitter rootstocks of ferns are

sometimes used for dressing some leathers and as a substitute for hops in brewing beer.

Fern fronds are easily gathered and pressed, and to collect the ferns of any particular region is a fascinating as well as an instructive pastime.

**Ferret.** The ferret, a slender little quadruped used to drive rabbits out of their holes in rabbit-hunting, and also to kill rats and mice, is a half-tamed variety of the polecat. Frequently it is an albino, with yellowish-white fur and pink eyes, but there is also a brown breed. The body is rather over a foot long with a tail of 5½ inches.

When trained and used in hunting rabbits the ferret is sometimes provided with a muzzle or "cope," which keeps him from killing the



EXPANDING FERN FRONDS

Few natural objects are so beautiful as unrolling fern fronds, which you may find in the woods and on shady banks during the spring. Here are some of the male fern, in various stages from the first tight shepherd's crook onwards.



## A GREEN FOREST OF GRACEFUL FERNS



This picture in the interior of a greenhouse will give you an idea of the amazing variety of form and size found among Ferns. Being shadow-loving plants they thrive in dense clusters like these. The decorative effect of their lace like fronds is unsurpassed among plants, and this, combined with the hardy constitutions that most of them possess, makes them favourites of the household and greenhouse.



THE FERRET, SMALL BUT FIERCE

Though it looks harmless enough, this is one of the most bloodthirsty little creatures you are ever likely to meet. It is a semi-domesticated animal used chiefly for driving rats and rabbits out of their burrows

*Photo C Reid*

prey. If this were not done the ferret might kill the rabbit, gorge himself on its blood, and then go to sleep in the rabbit's burrow. Nowadays ferrets are also used with great success for ratting. The ferret drives the rats into the open, where they are killed with sticks.

**Fertilizers.** Thirteen chemical elements are the minimum necessary for plant growth. Ten of these are usually obtainable in sufficient quantities from the ordinary soil that is well aerated and watered. But three of them—nitrogen, potassium and phosphorus—are often lacking in certain soils, and are rapidly exhausted by crops. A ton of wheat, for example, takes away from the soil about 47 pounds of nitrogen, 18 pounds of phosphoric acid, and 12 pounds of potash. If the soil is to keep on producing good crops, these substances must be annually replaced in proper proportions (*See Soil*). This may be done either by the use of manure, or by the application of commercial fertilizers, which merely add the plant foods. The most important and frequently needed of these is nitrogen, in the form of nitrates or other nitrogen compounds. One of the chief sources of supply is northern Chile, where nitrogen is scraped off the ground in the form of nitrate of soda. Other nitrogenous fertilizers are ammonium sulphate, a by-product of the manufacture of coke, various organic substances such as meat waste, fish meal and cotton-seed meal, and artificially fixed nitrogen in the form of calcium nitrate and calcium cyanamide.

The World War of 1914-18 gave great impetus to the production of fertilizers in all parts of the world. One outcome was the "fixation" of nitrogen, and now a considerable quantity of nitrogenous fertilizers is so obtained. Commercial fertilizers, however, play a small part in restoring nitrogen to the soil in comparison with the work of organic manures and such crops as alfalfa, which, unlike other crops,

replenish instead of exhausting the nitrogen of the soil. Clover and other leguminous plants produce the same effect.

Crushed phosphate rocks, the bones of animals and basic or phosphate slag, a by-product in the manufacture of steel from certain kinds of iron, are the main sources of phosphorus fertilizers. Potash occurs underground in Germany, in Alsace, and in India, Egypt and Persia.

Guano, a deposit formed especially on the Pacific South American coast and islands by the excrement and carcasses of sea-birds, was once the most important commercial fertilizer, and huge fortunes were made in the trade. But the supply has now been so exhausted that it is unimportant except locally. Other substances sometimes used as fertilizers are wood ashes, ground limestone, coal-ashes, mussel and lobster shells, marl (a soil consisting of clay and carbonate of lime), sewage and street sweepings.

To encourage farmers to rehabilitate their land by a more generous use of fertilizers, the British Government have recently provided a subsidy which enables farmers to buy certain fertilizers at low prices.

**Feudal System.** Suppose by some great national misfortune the Government of Great Britain should suddenly vanish, together with the Army, Navy, the police and courts, and all the machinery of law-making, taxation, road construction and social services. Where would men then find protection for themselves and their families, and how would the difficult work of government be carried on?

We know what the answer was when the German barbarians swept down from the north and overthrew the old Roman Empire, from the 4th to the 9th centuries. That answer is summed up in the word feudalism, or the feudal system, which has been described as "anarchy roughly organized."

The following was the system which, in outline, was set up in different parts of western Europe, and lasted until the end of the Middle Ages. First of all there was a king surrounded by a body of attendants. In theory he owned all the land, though the actual use of a large portion of it was enjoyed by some 400 or 500 great landholders, each possessing one or more strong castles, who received the land on condition that he helped the king with counsel and aided him in war with an agreed number of men.

The actual use of much of the land of these great landholders was enjoyed by other men, who were similarly masters of strong castles, on the same condition of military and other service as that under which the great landholders themselves held from the king. These in turn subdivided their lands, until at the bottom of the scale were lords who had just enough land and peasants to enable the holder to live comfortably.

and to provide himself with horse and weapons for fighting

Each of these landholders was a little king within the limits of his land. Such landholders were known as "nobles" and "lords." Their household servants and the peasants who worked their lands were called "serfs" or "villeins," for the whole feudal system rested on a substratum of serfdom. (See Slavery. Those who controlled a certain number of villages and serfs, and to whom certain other "vassals" (as they were called) owed military service, were called barons, counts, or dukes.

The ceremony by which a man became a vassal usually took place before a number of other vassals. The man who was to receive the land knelt at the feet of his king or lord, and placing his hands within those of the lord declared that he became his "man" to serve him in all such ways as a free man should serve his lord. This ceremony was called doing homage, from the Latin word *homo*, meaning "man." Next the vassal arose and placed his hand on the Bible or the relics of some saint, and swore to keep the promise he had just made. This was the oath of fealty. Finally the lord, as a sign that the vassal had become the holder of the land, handed over to him a clod of earth or a twig, or some other object. This part of the ceremony was known as investiture.

The vassal was now said to hold a "fief," which would pass to his eldest son on his death,

and for which only occasional payments were made—as when the lord knighted his eldest son, when his eldest daughter was married, or when he had to be ransomed from captivity. Thus was formed a solemn contract binding on both parties. The king, for example, could not tax his vassals—except on the three occasions named above—unless they had first given their consent to the imposition. In England the vassals made use of this principle steadily to limit the power of the king.

The feudal system took shape in the 8th to the 10th centuries. France was the land of its earliest and most complete development, but in some form or other it was found in all the countries of western Europe. It flourished more especially from the 10th to the end of the 13th century. After that period a transformation set in, through the increasing power of the kings, supported by the Church and the newly arising towns with their commerce and wealth, and the new weapon of gunpowder, which enabled the government to blow to pieces the rocky castles of the defiant robber barons. Even down to the 19th century there remained many survivals of feudalism, in the laws, landholding and social usages of European countries.

**Fielding, HENRY (1707–1754)** A very important figure in the early history of the English novel, Fielding passed on his torch to the great novelists that followed him, more particularly perhaps to Dickens. He was born at Sharpham



#### A VASSAL 'DOING HOMAGE' IN FEUDAL DAYS

Here is a vassal kneeling before his feudal lord, with both his hands placed in those of his lord. He says: "Sire, I become your man from this day forth, of life and limb, and will hold faith to you for the lands I claim to hold from you, and I will serve you in all ways that a free man should." Then the lord raises him to his feet, and the vassal swears his "oath of fealty," after which the lord "invests" him with his "fief," by handing him that lance which the nearest man-at-arms holds

Park, near Glastonbury, April 22, 1707, and was educated at Eton and at the University of Leiden. Coming to London about the age of twenty, he set about earning his living by his pen, and wrote a number of farces and light pieces, most of which, though they filled his pocket for the moment, are now looked upon as little more than literary curiosities. He was called to the Bar in 1740. Nine years later he was appointed, through the interest of an old school-fellow, a justice of the peace for Middlesex and Westminster, and proved a conscientious and pains-taking magistrate.

The turning point of his career came about in 1740, when Samuel Richardson's novel "Pamela" appeared. Fielding, who was good humouredly contemptuous of the sickly sentimentality of "Pamela," planned his "Joseph Andrews" with a burlesque hero who, like Richardson's virtuous heroine, was to escape temptation in the most ludicrous situations. As so often happens with creative artists, Fielding's characters outstripped his design and insisted on living their own lives. The book thus becomes far more than mere burlesque; it is now a novel of tremendous vitality, from which emerge characters, such as Parson Adams, even more clearly limned than the hero himself.

"Joseph Andrews" was published in 1742, and was followed in 1743 by "Jonathan Wild," although it seems probable that this grim portrayal of an 18th-century "gangster" may have been written first. In 1749 came "Tom Jones," regarded by some critics as the greatest novel ever written. The plot is a masterpiece of construction, the narrative is Homeric in its power to sustain interest, while the intensely life-like characters—the hard-drinking, hard-swearing Squire Western, his beautiful and lovable daughter Sophia, the hypocrite Blifil, the humbugs Thwackem and Square, and the ingenuous Partridge will live for ever. "Tom Jones" is undoubtedly "strong meat," but



#### PARSON ADAMS TO THE RESCUE

Not all Fielding's characters are tough rogues. Here is simple, kindly Parson Adams, whose good intentions are always getting him into scrapes. This illustration, from a 1793 edition of "Joseph Andrews" shows him valiantly protecting a chambermaid from her furious mistress.

Fielding does not claim to show "models of perfection." He sets out to describe ordinary people and, while he neither disguises nor excuses their shortcomings, he achieves his declared object—"to recommend goodness and innocence." His last novel, "Amelia" (1751), is subdued compared with the boisterous high spirits of "Tom Jones."

Fielding's health declined early. He was a martyr to gout, and doubtless the hardships and imprudences of his youth told upon his constitution. Moreover, he appears to have poisoned himself with quack remedies. In 1754 he went to Lisbon in search of new health. His delightful "Journal" of that voyage closed his literary career, for he died there two months after his arrival, October 8, 1754, aged only 47 years.

**Fifeshire.** The "Kingdom" of Fife lies on the east coast of Scotland between the Firths of Tay and Forth, and has an area of 500 sq miles. The surface is, as a whole, low-lying

and fertile, and 75 per cent of the land is under cultivation. The coastal towns and villages are mostly engaged in fishing, but there are many mines, particularly coal-mines, in the Leven district, limeum factories at Kirkcaldy, and linen manufactures at Dunfermline. Cupar, or Cupar-Fife (pop 4,000), is the county town.

St Andrews is perhaps the most famous historic town in the county, with its ruined castle and cathedral, university and golf courses. Dunfermline, which now includes the naval base of Rosyth, preserves the ruins of the castle of King Malcolm Canmore. Here was born Andrew Carnegie, the steel magnate of U.S.A., and in his later life benefactor of many educational projects. Population of Fifeshire, 276,000.

**Fig.** Did you know that the luscious pear-shaped figs, full of delicious pulp, are not the true fruit of the fig tree? They are rather the receptacles within which innumerable minute flowers grow and ripen in great numbers, so



forming the true fruits, which we commonly call "seeds." This receptacle is closed save for a little hole at the very tip, so that cross-pollination cannot be accomplished in the usual way—by the wind or by ordinary insects.

The fig-wasps breed in the fruit of the wild fig. At the proper time bunches of these wild, Capri figs as they are called are hung in the tops of the cultivated trees, and, when the little wasps push out to find a place to lay their eggs, their bodies become covered with the pollen from the wild fig flowers. As they enter the fig, this pollen is brushed off on the flowers and fertilizes them. This process is only necessary in the case of the Smyrna figs. One Capri fig tree is sufficient to pollinate 100 cultivated trees.

#### Figs of Many Varieties

There are many varieties of fig which do not require cross pollination, but their fruit is not so delicious and cannot be dried so easily and well as the Smyrna fig. The different species vary greatly, from low trailing vines to good-sized trees. The fruits vary in colour from deep purple to yellow or nearly white. The Smyrna fig is a small bushy tree and rarely grows more than 18 or 20 feet high. Other species vary from trailing shrubs to gigantic trees. The rubber tree (*Ficus elastica*), from which most of the East India rubber comes, is a species of fig.

As far back as history goes the fig has been a domestic tree. "Beneath the vine and fig tree" is used more than once in the Old Testament to designate "home." For centuries the fruit, fresh or dried, has made up a large part

of the food of the natives of western Asia and southern Europe. Its juice is used to make a drink and also to dye cloth, its leaves are employed to polish ivory, and the bark makes cord. Syrup of figs is a widely used laxative.

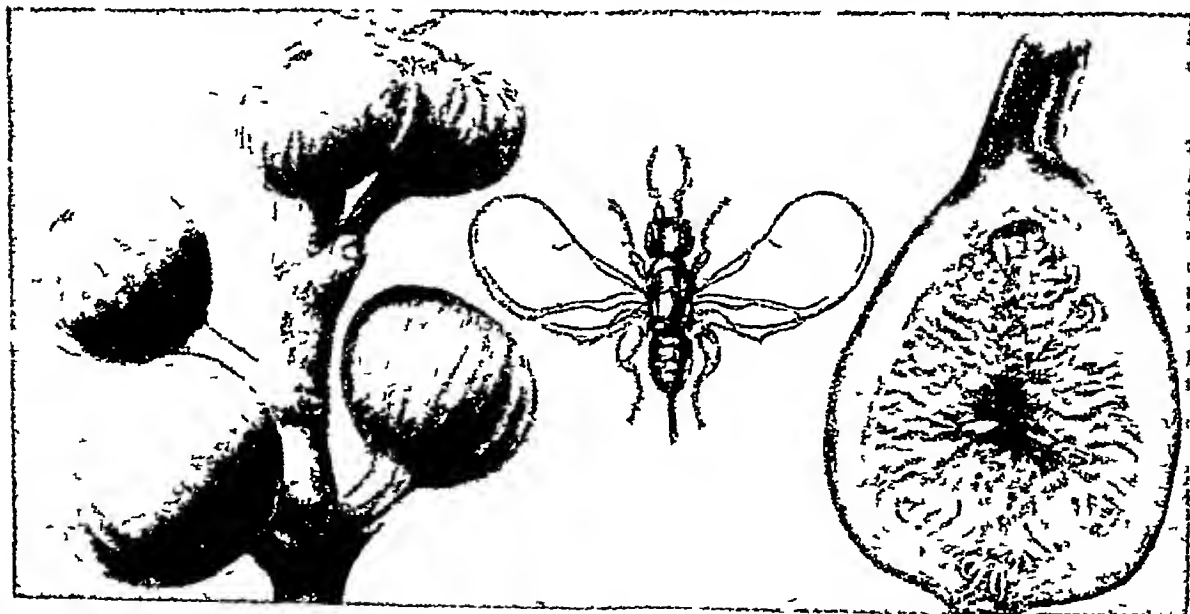
**Figure of Speech.** When Wordsworth says of Milton, "Thy soul was like a star and dwelt apart," we get a stronger impression of Milton's loftiness of spirit and his solitude than the plain words could possibly give us. This phrase is a figure of speech, in which there is an expressed comparison of one object to something of an entirely different order, and because of the use of the term *like*, is called a "simile."

When Shakespeare says in "Julius Caesar"—

There is a tide in the affairs of men,  
Which, taken at the flood, leads on to fortune,

he does not expressly compare opportunity to a tide, but leaves the comparison to be inferred from his words. This figure of speech, in which a comparison between two unlike objects is not stated but only implied, or in which one is identified with the other, is called "metaphor." It is a more daring and generally more powerful figure than simile. It is exposed, however, to the danger of what is called "mixed metaphor," as in the case of the Irishman who said of his opponent that he "never opened his mouth but he put his foot in it."

When the metaphor represents a lifeless object as a person, we call the figure "personification." Thus Shelley speaks of the moon as "that orb'd maiden with white fire laden."



#### THE STORY OF THE WASP THAT HELPS TO MAKE FIGS

Have you ever noticed the round hole in the end of a Smyrna fig? Its existence enables Nature, with the aid of the tiny fig-wasp here shown (considerably enlarged), to perform one of her most unusual bits of magic. The Smyrna fig does not ripen unless it is provided with pollen from the Capri fig. The little wasps grow to maturity in the Capri fruit, then crawl through the hole into the Smyrna fig and deposit inside it the Capri pollen that clings to their bodies. Thereupon the fig ripens into the delicious fruit we all love.

Sometimes, in order to arrest attention or to produce a vivid impression, the writer or speaker expresses more than the truth, or exaggerates, as when we say "a thousand apologies" and mean only one. This figure of speech is known as "hyperbole" (Greek overshooting, excess).

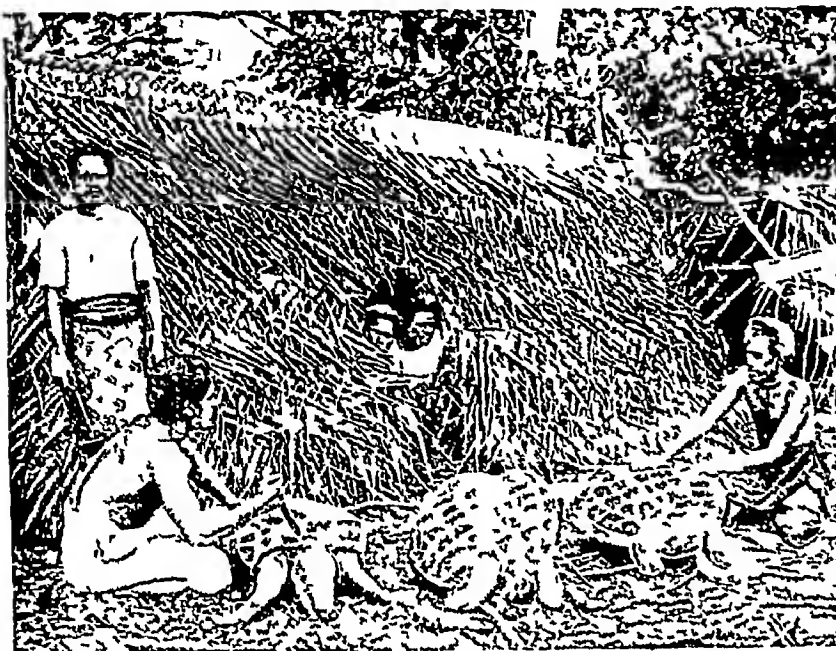
Other figures of speech owe their force to the use or arrangement of words in such a way that the sound aids the sense or produces greater emphasis. Thus, in "alliteration" the effect is

produced by using words beginning with the same sound in close succession, as when we speak of "might and main," or "apt alliteration's artful aid." Often the effect of alliteration is very beautiful, as in Swinburne's "With hush of leaves and ripple of rain." But often it is a mere trick, without beauty or force.

**Fiji.** (Pron fē'-jē) A hundred years ago few of the white men in the Pacific could be induced to visit the beautiful Fiji Islands, for no

spot on earth had a more evil reputation. The handsome dark skinned natives, with their high mops of frizzled hair, seemed courteous and intelligent at first, but in reality they were most cruel and treacherous cannibals. On quiet nights the sinister roll of the cannibal drums and the glare of the feasting fires warned ships' captains far out at sea to beware the Fiji reefs.

Yet today there are few more law abiding places in the South Seas than these same Fiji Islands. In 1874 old Thakombau, the famous "King of the Cannibal Islands," put his country under British rule, although cannibal feasts were held up to 1890.



**FIJIAN ISLANDERS AT WORK AND IN FESTIVE MOOD**

In the top picture some Fijians are preparing turtles in readiness for a feast. The Fijians have hearty appetites and sturdy digestions and their ceremonial feasts sometimes take months to prepare. The lower picture features a Fijian "meke" or war dance. Having reached fever pitch, these kilted warriors squirm and prance in every conceivable attitude of savage ferocity, brandishing their weapons with slick turns of the hand and emitting blood curdling war cries.

Photos (top) Sir Basil Thomson A.C.B. (lower) George Brown "Melanesians and Polynesians" Macmillan & Co. Ltd.



The Fiji group, situated west of Samoa and about 1,200 miles due north of New Zealand, is composed of about 250 islands, 80 of which are inhabited. The largest, Viti Levu, has an area of 4,053 sq miles, the second in size is Vanua Levu, with an area of 2,130 sq miles. The others are much smaller.

As we approach Suva, the capital (population 1,700), by steamer, it seems impossible to believe that the dark tragedies of the past could have taken place in surroundings of such entrancing beauty. The deep blue of the ocean passes gradually into turquoise and emerald among the coral reefs, where the shallow waters teem with multi-coloured fishes. Circling the shore front is a magnificent avenue lined with trees and white houses. Beyond the town the hills are clothed in the thick dark green of the tropical vegetation, all aflame with the scarlet hibiscus blossoms. On Viti Levu, as on the other large islands of the Fiji group, the coast hills rise rapidly to high peaks, most of them ancient volcanoes, often over 3,000 feet high. The islands are fertile, the chief products being sugar, copra (dried coconut kernels), molasses, pearl shell, turtle shell, trepang (smoked sea cucumbers), and rare woods. Between December and April hurricanes occur which injure the crops and rip down the flimsy native dwellings, but the general climate is excellent for the tropics with a rather high mean insular rainfall.

Fiji is a British crown colony, with a Governor at Suva, assisted by several provincial commissioners, some of whom are native chiefs. The Governor is also High Commissioner for the Western Pacific and controls most of the smaller British islands in the South Seas.

The group's population is now just over 200,000 of which about 100,000 are Fijians, 5,000 whites, 85,000 East Indians, and the remainder Chinese or natives of other Pacific islands. The coolies from India and China have been brought in largely because the native Fijian dislikes hard work, even when profitable. (See map with article Pacific Ocean)

**Finch.** Twelve hundred different species of finches, scattered through the temperate and tropical countries of the world, make up the



CHEERY CHAFFINCH AT HOME

One of our commonest birds the chaffinch is also a completely typical finch. It has a loud cheerful song, brightly-coloured plumage, and, above all, the thick strong short bill which is the chief characteristic of this family. As you can see from this photograph its nest is a work of art—a neat cup surrounded with bits of lichen which give it a resemblance to the boughs on which it is placed.

family *Fringillidae*, the largest of all bird families. All have the stout bill, conical in shape, possessed of great seed crushing power. Most species are valued by the farmer, as they feed largely on weed seeds.

The plumage varies from the dusky hues of northern sparrows to the vivid blues, scarlets, and yellows of the tropical finches. The vocal powers also vary, for the finch family includes, along with its non-singing members, such songsters as the canaries.

The goldfinch, *Carduelis elegans*, is one of the most beautiful of our British finches. Over five inches long, the male bird has black, red, and white bands on his head, golden yellow and black on the wings. He and his more sombre mate are especially fond of thistle seed. His habits and song are as cheery as his coat.

A curious finch is the crossbill, or grosbeak, for the curved mandibles of his sharp pointed bill cross in a way that gives the impression of a deformity. This is really a special adaptation to the bird's feeding habits, enabling it to deal rapidly and effectively with pine cones, from which it extracts the seeds, its favourite food. The crossbill is rather a rare bird in this country, usually arriving in waves and disappearing after a year or two's residence.

Another well-known member of this great finch family which is resident in Britain is the

bullfinch (*Pyrrhula europæa*) This handsome bird with black head and rose red underparts is a familiar visitor to our gardens, especially in the spring of the year, when he is sometimes very destructive to fruit buds

The greenfinch (*Ligurinus chloris*) is easy to know by his colour, and his long-drawn, single wheezing note He is with us all the year

The chaffinch is a very common bird in this country, and stays all the year round In the winter the females often form flocks, while the males remain solitary Hence the Latin name, *Fringilla coelebs* or "bachelor" finch The brambling, very like a chaffinch, but with a white rump, is a winter visitor The siskin, another finch, is found in the pine woods of Scotland, but is less common in England

One of the most familiar members of the finch family is the linnet, and because of its naturally sweet song it is favoured as a cage bird It inhabits many parts of England and has a rosy crown and breast The smallest of our finches is the lesser redpoll, which is a close relative of the linnet, but much less widely distributed

All the other finches fade into insignificance as regards numbers when compared with the house sparrow, *Passer domesticus*, which is far and away the most common bird we have in Britain The house sparrow feeds almost entirely on grain during the late summer and autumn, and is a great robber of stack yards in the winter, it is therefore regarded by farmers as one of the worst of pests (See illustrations in pages 529 and 531)

## The ARTIST'S Eager QUEST for BEAUTY

*What is the origin of the universal reaching out for beauty which is the source of what we call the Fine Arts? What are the ways in which it finds expression? These are some of the questions answered in this article*

**Fine Arts.** The various arts are broadly divided into two classes, the useful arts and the fine arts The former of these terms in-



cludes such branches of activity as industrial arts, manual arts, household arts, and others The fine arts are considered to begin when there is a distinct reaching out for the expression of beauty in the thing created

In accordance with this definition, the fine arts are generally considered to be three in number, namely

architecture, sculpture, and painting (*qq v*) To these some writers have invariably attempted to add others, especially poetry and music, while dancing and acting have also been put forward as fine arts One idea of fine art may be gleaned from the following example A famous artist says "When I paint a wave I am that wave" True And it is quite as true that when you look at his painting of the wave you are that wave When he sweeps his brush up over the canvas, he feels himself doing just what the wave is doing—he becomes, as he says, a sort of conscious wave, when you sweep your eye over the lines where his brush has led, you too become a sort of racing, conscious wave

In answer to your question "What is a wave?" the scientist will tell you that a wave is the result of certain causes and principles, he will show you the materials that compose

the wave, and, if your curiosity is still unsatisfied, he will separate those materials into their elements He will show you the effects of conditions upon them, and he may continue, showing cause, and cause of cause, to the beginning of the world, or, in the other direction, he may deal with effect upon effect to the end of it He always leads you into the relations of the wave to all other things, and always away from the wave itself

The artist, on the other hand, fixes your attention on the wave, ignoring in his picture the fact that anything else exists "The real work of art—its way leads nowhere and its frame ends the world" He bends all lines of attention to the thing in hand, fills the consciousness with it, excluding all other things, and uses it as a means of bringing you into the mood which he has experienced

Fine art may bring us into a condition of repose, by making captive, first, our sense of seeing and our imagination, and thence, through the unity and intensity of its interest, our whole consciousness—until we forget all else

### Art's Appeal to Our Emotions

But Art may also, too, rouse us to heights of far more active emotion, and, indeed, it is an essential of the fine arts that they do appeal, through our sense of beauty, to the emotions This is not to say that everything which is included in the fine arts is necessarily of positive beauty, there are sculptures (for example, some of Jacob Epstein's) and paintings which rouse intense horror and repugnance, and yet no reasonable person would deny that they belonged to the fine arts If they did not they would not arouse these emotions

These works are likewise far removed from those produced by the purely "representational" artists, whose work is at best an exact copy of Nature. At one time there was a general idea that true beauty could only be got by copying Nature more or less exactly, but there are few people nowadays who would hold this tenet unconditionally.

In any case, it is clear that Nature does not always exist in perfect harmonies or perfect contrasts. Nature, indeed, has other business in hand than to form perfect pictures. If he would produce pictorial beauty, the artist must make many a change in the "landscape with figures amid which we dwell." He must select, arrange, subdue, and accent the elements of his work, so that they will produce the mood or set forth the idea which he is endeavouring to present. This process of selection and arrangement is technically known as "composition." Let us consider some of the requirements of good composition and how it is obtained.

When, in looking over the fields, we send our glance from the trees to the hills beyond them, when we remove our eyes from a person to whom we are speaking, to the walls just behind him, when, in fact, we leave off looking at any one thing and look at something either farther away or nearer than that at which we were looking before, our eyes change their focus for the occasion in somewhat the way in which the focus of a camera is changed to suit varying distances.

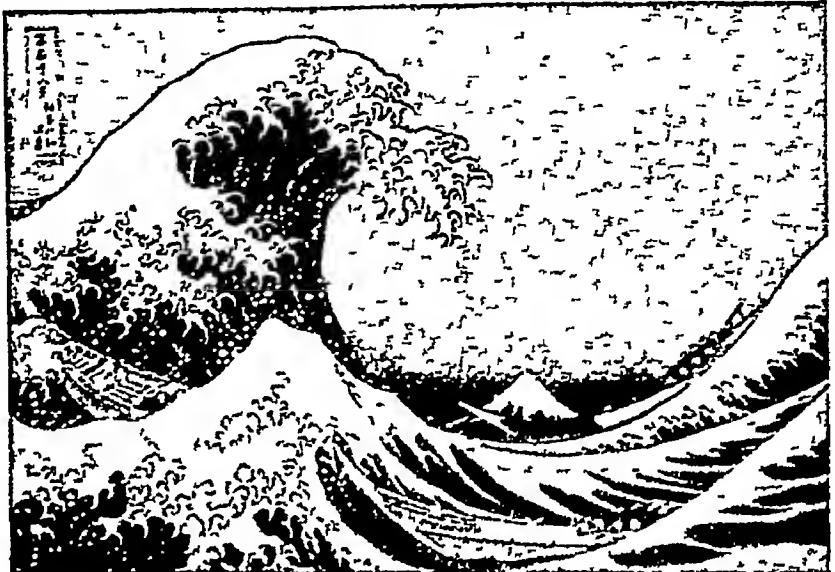
The eye, however, is by far the more subtle instrument, and is sensitive to variations of distance which would make no appreciable difference to the camera. It may, therefore, be said that each thing we see in Nature is, when it is being seen, the centre of a little picture all its own, and that it is the sum of a number of these little pictures which gives us our impression of "all outdoors."

#### Concentrating on One Theme

Now, if the artist were to try to paint in one picture the hills as he sees them when looking directly at them, the trees as he sees them when looking directly at them, the clouds as he sees them when looking directly at them, he would have a picture with as many separate interests as it contained objects—a picture which could never have unity or give repose of any sort. So

the artist must select some one thing for the main theme of his picture, and this he must place before all other things which may happen to occur in it.

A study of great paintings will show the various ways in which artists accomplish this suppression of the secondary things and emphasis of the important ones. It will show that a figure may be made prominent by the position it occupies on the canvas, by its relations to other figures, by its having a space of comparative quiet around it (notice the effect of the haloes around the heads in the old master paintings of the saints), by the focusing of many important



#### THE FINE ART OF JAPANESE COLOUR PRINTING

This picture is called "The Hollow of the Deep Sea Wave off Kanagawa." Do you see how well it is "composed" so as to give you the full effect of that crashing wave? It is by Hokusai, born at Tokyo in 1760. His illustrations for books form a complete record of Japanese life, yet his own countrymen do not think him as great as we do.

*British Museum*

lines upon it or the introduction of a contrast near it, by its being more minutely drawn and finished than the rest of the picture, and by the suppression of other figures or groups of figures through partially hiding them from view, turning them away from the spectator, causing them to look or point toward the principal figure or throwing them into a subdued tone.

Consistency of character, which has been called harmony, consistency of attractions, which has been called balance, and consistency of movement, which has been called rhythm, will keep all elements of the work together in an integral whole. Here again the artist in forming his work must exercise his aesthetic judgment, varying from Nature's appearances if need be, to bring finer proportion into his work, more perfect unity, and deeper meaning.

Let us look at Corot's landscape "Morning." It has come to be called "The Dance of the Nymphs." Is this because there is a group of tiny figures at the bottom—who in truth are

scarcely dancing and who may hardly be called nymphs? Or is it because of the witchery of that great movement which takes us from the bottom up into the picture, across the top and down the other side, lastly circling round and round the bit of sky in the centre, leading us in an airy dance through the tree tops?

For a contrasting mood see Turner's great picture, "The Fighting Téméraire" What is there about this picture to show us that this old ship has valiantly fought England's battles, or to tell us that she is being towed away for breaking up? And yet Ruskin, Turner's greatest interpreter, says that, of all pictures not visibly involving human pain, this is the saddest. What has the artist done to make us feel the solemnity of this occasion?

We see a sheet of still water under a great bending sunset sky. On the other side a tall ship is coming up, towed by a black tug. Long ripples are thrown to left and right, and smoke pours back from the funnel of the tug. Shadows are gathering from all sides, and there are the buildings of a great city beyond in the gloom.

Study carefully the use of lines. Are they like those merry ones that circle round the canvas

of Corot's "Morning"? Or are they the lines which we see in the solemn groves of pine or cypress, in the desert, and in the great cathedrals? Are they not like figures in a funeral march? Has the artist accepted Nature only as he found her?

#### In What Beauty Lies

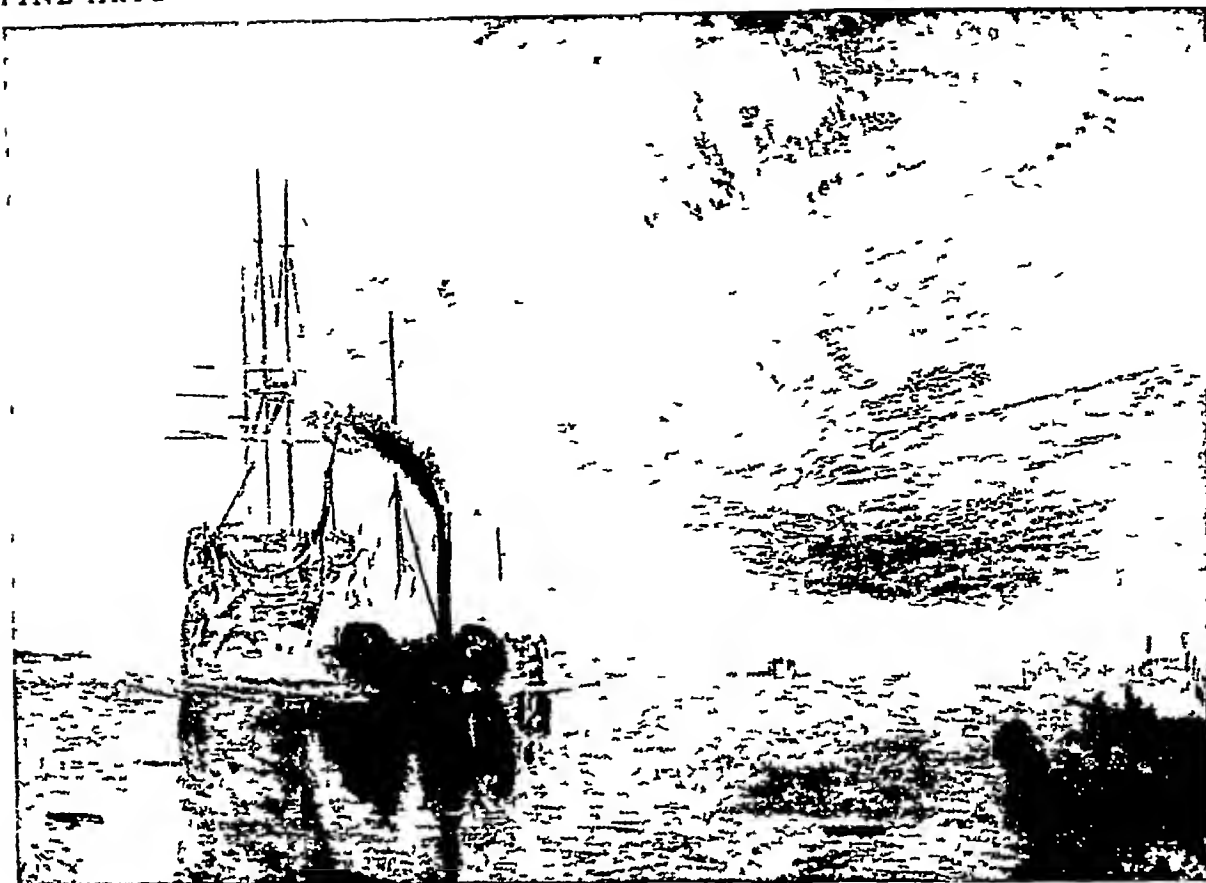
The beauty of a picture or a piece of sculpture does not lie in pleasing the visual sense alone. Perhaps it is impossible for this sense to be engaged at all without the mind's receiving some deeper message through it. It is this fact which has caused critics to observe that art is a sort of language. But the message which that language has to deliver is not an intellectual one. It is not primarily for the rehearsing of facts that art exists. The message which a picture has to give comes to us in the form of an experience, a mood which the work awakens within us—not a story which the thing can tell us.

Expression, therefore, is the chief consideration which compels an artist always to turn away more or less from the copying of Nature, and the more deep and difficult the emotion he is trying to express, the finer will be a great artist's work. Yet at the same time—and this



#### MYSTERY AND POETRY IN A COROT LANDSCAPE

Not until he was over fifty did Jean-Baptiste Corot, the great 19th-century French painter, produce his most typical work, full of free expression and feeling. The famous picture above, "Morning—Dance of the Nymphs," is in the Louvre at Paris. "Nature is too green," said Corot, and to get his unreal effects he used more sombre colours than you and I actually see. Another of Corot's landscapes is reproduced in page 1149.



### SUPREME EXAMPLE OF TURNER'S ART

'The Fighting Temeraire' reposes in the National Gallery, London. Turner was the greatest marine painter Britain ever had, and in this picture his technical gifts are supremely demonstrated. Notice the handling of the sky and the setting sun, the shadows, the delicacy of the line work and the balancing of masses—everything in it so hangs together as to create in the spectator deep melancholy. The vessel, 'old bulldog' of the British Navy, is being towed to her last berth.

National Gallery London photo W. F. Mansell

applies especially to much of the most "modern" art—there is always the difficulty that the artist may be expressing a feeling or an emotion so far removed from popular experience that it is beyond the vast majority of the public.

**Finger-prints.** Look closely at the ball of your right thumb. You will see that the skin is covered with fine curved lines or ridges. Press the ball on an ink pad and then on a sheet of white paper. This will give you your thumb

autograph. No other thumb in the world will give a print just like it, and the same is true of all your fingers and of everybody's fingers.

This fact has been put to practical use by the police of many countries. When a criminal is caught, he is photographed and his finger-prints are taken to identify him against possible later offences. Criminals are thus frequently detected by their finger-prints on door-knobs, window-panes, etc., at the scene of their crime.



### YOUR FINGER PRINTS ALWAYS 'STAY PUT'

At one time or another the claim is made that the finger-prints of two persons have been found to be alike, but the claim has always been disproved. Here you see three sets of finger-prints of the same person, taken respectively (from left to right) at ages 26, 44, and 83. The loops and ridges have remained practically unchanged right into old age even when the skin is cracked and shrivelled. It is a diverting game to take the finger-print 'autographs' of one's friends and to see how they differ in essentials, however much they may be alike in other respects.



## FINGER PRINTS

Finger prints for identifying persons who sign legal documents were first used by the Chinese, and in some early instances in the history of England thumb-prints have served as the signatures of persons who could not write. But the system did not come into use for the identification of criminals until Sir Francis Galton published in 1892 a detailed scientific study of finger-prints. Sir Edward Henry, Commissioner of the Metropolitan Police of London, made this the basis of a filing system which enables an expert to identify a finger print from among many thousands in a few minutes. When a crime is committed the police take photographs of everything that the criminal may have touched. The photographs are then compared with those at Scotland Yard in order to ascertain whether the offender is already known to the police.

The chance that two finger prints are identical has been shown to be less than one in sixty-four thousand million, and as it is customary to take the imprints of three or more fingers, the chance of error is entirely eliminated.

**Finland.** The war-born republic of Finland is bordered on the east by Russia and on the west by the Gulf of Bothnia and by Sweden.

The country consists of a plateau, hills seldom rising above 400 to 600 feet, and it is only in the extreme north that we find the mountains reach-

## FINLAND

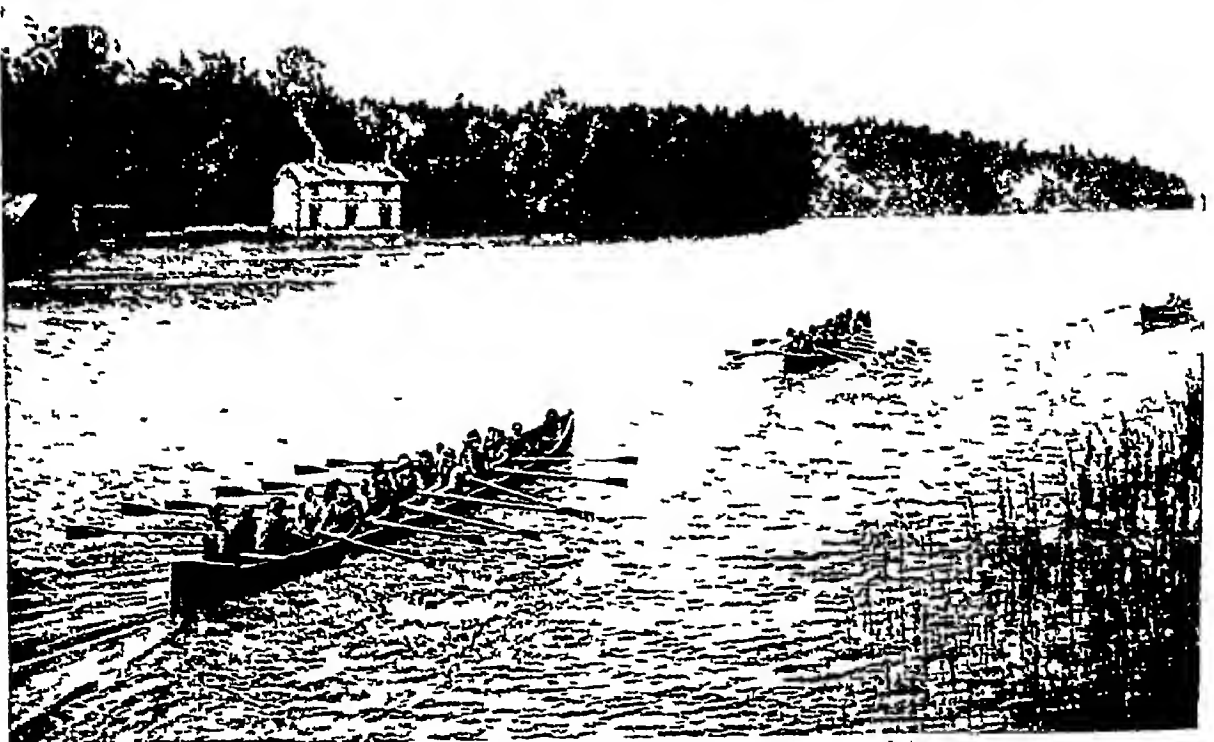
ing a height of 3,000 to 4,000 feet. The Baltic margin of Finland is girded by steep cliffs fringed with many rocky islands, including the Åland group in the mouth of the Gulf of Bothnia.

The climate is rigorous and the winters long and cold, rivers being frozen from December to May, but the summers, with the sun disappearing only for an hour or so, or not at all, are so warm that crops ripen in six or seven weeks. The hills are covered with the delicate foliage and white stems of birches, backed by dark pines and firs, and the rock strewn meadows in summer are bright with wild flowers growing round the cheerful red barns and farmhouses.

### Land of a Thousand Lakes

Finland has been called the Land of a Thousand Lakes, and, indeed, 11 per cent of the surface consists of lakes. The forests occupy 63 per cent of the land surface and provide the country with its chief industries, saw-mill products and wood pulp. These form 70 per cent of Finnish exports. Water-power is highly developed. Only 7 per cent of the land is cultivated, but another 5 per cent is meadow. Dairy products and fish are other important exports.

The Finns are related to the Turks and to the Magyars of Hungary, and speak a language quite different from their Slav and Scandinavian neighbours. Modern Finland is noted for the stamina and speed of her athletes. The area of



FINNISH VILLAGERS ROWING TO CHURCH

In a country like Finland, with so much of its area under water, the villages are scattered far apart in the lake districts. Consequently, since one church has to serve the needs of several villages, the people have to be carried somehow to their devotions, and, railways being few, they are generally brought by water. Here is a scene that is very common on Sunday mornings in these areas. The boats proceed from village to village to collect the peasant churchgoers. They are quite large with a capacity sometimes of over 100 persons and are built by the villagers themselves.

*Photo Finnish Legation*



## FINLAND

the republic before the Russian invasion in 1939 was 134,557 sq miles, and its population about 3,700,000

Until the 12th century Finland was a free country under warlike kings. It was then conquered by Sweden and held under a liberal constitution until 1809, when it was ceded to Russia as a grand duchy. In 1917 the Finns took advantage of the Russian Revolution to declare their independence.

In 1939 Russia made demands, the granting of which would have destroyed effectively the independence of Finland. They were therefore refused by the Finns, who, however, showed a willingness to negotiate. Russia thereupon invaded Finland by land, sea, and air on November 30, and set up a puppet government in opposition to the real government at Helsinki. Bitter fighting took place until March 12, 1940, when a Treaty of Peace was signed by which strategic areas, together with the Mannerheim Line, Vibourg, and Hangoe were ceded to the Russians.

The percentage of Finns who can read and write is high. There is an excellent university at Helsinki (Helsingfors), the capital (population about 277,000), and two universities at Turku (Åbo), one Swedish and the other Finnish. Technical education in Finland is excellent and there are schools of navigation, commerce, industry, arts and crafts, agriculture, dairying, cattle management, and forestry.

**Fir.** Although there are many different types of tree which we class as firs, they can easily be distinguished from the pines, with which they are often confused. For in the pine the long, slender needles are grouped in sheaths by twos, threes, fours, or fives, whereas the short, flat needles of the fir tree are single and grow in spiral rows round the branches. The needles of the fir are usually dark green above and light green below. The cones grow erect on the branches. Various firs are distributed all over the northern hemisphere, usually growing in high altitudes or cold climates and varying greatly in size and appearance. As a whole they are highly prized for their timber and resin or gums. The silver fir of Europe (*Abies pectinata*)



## NOT PINES BUT SILVER FIRS

Although none of the firs is successful as a timber tree in Britain, they are fairly popular for ornamental purposes. Here is a group of fine silver firs, which are easily distinguished by their flat topped spire of branches. The name 'silver' refers to the undersides of the needles or, some would say to the bark of the trunk. These specimens are old trees and therefore somewhat bare.

grows in large forests on the French slopes of the Pyrenees and elsewhere, at times attaining a height of 150 feet and a diameter of 6 feet. The silver fir of the American Pacific coast (*Abies grandis*) towers to 200 feet in height.

Among the many other smaller species is the fragrant balsam fir (*Abies balsamea*) of Canada and the northern United States. It yields the Canada balsam used in mounting microscopic specimens. None of these is native to Britain, but many kinds are grown in parks and gardens.

# The Flaming SPIRIT that MAN has TAMED

*Here we learn many interesting things about the "red monster" that Man has trained to come and go at his bidding. Perhaps the most interesting paragraphs are those describing some of the many ways in which fire has been, and is, produced*

**Fire.** In these days it is hard to realize the awe with which early peoples regarded the "red monster," which they believed came down



in magic ways from heaven (see Prometheus), and which many of them worshipped as a representative of their gods (See Zoroaster). The ancient Greek philosophers conceived the idea that fire, air, earth, and water were the four elements of which the whole universe was made.

It is supposed that the earliest savages obtained their fire accidentally, from trees set ablaze by lightning, or from erupting volcanoes, and that they kept it alive carefully in huts and caves. Careful inquiries go to prove that Man from the earliest days has never been without fire for warmth and cooking, and for protection from wild beasts, in whom it inspires terror.

By and by men discovered how to create fire by rubbing dry sticks together, and they invented fire drills to aid the process. When they began to chip flint to make axes they learned that fire may be drawn from stone, a method which developed into the flint-and-steel of comparatively recent times (See Matches). Still later men found that fire could be made by focusing the sun's rays through a glass lens.

But however much human beings turned fire to useful purposes, they remained ignorant of its true character until the great French chemist Antoine Lavoisier investigated, in 1783, the properties of oxygen, and laid the foundation for modern chemistry (See Oxygen). Popular indifference to great truths was never better illustrated than in Lavoisier's case, for he was condemned in 1794 to be guillotined.

Nevertheless, before his death Lavoisier had succeeded completely in disproving the old "phlogiston" theory, which held that when any object was heated or cooled this was due to a mysterious substance (phlogiston) which flowed into or out of the object in question. We know today that ordinary fire is due to the chemical process called oxidation, which means combustion through the combination of a substance with oxygen.

That is why fires need air to burn properly, and why a flame will go out after it has used up all the oxygen in a closed vessel. Almost anything will combine with oxygen, if enough time is allowed. Iron will decompose or rust if exposed long to damp air, and the rust is oxidized iron. When chemical combination is so rapid that it is accompanied by a flame it is called combustion.

To start combustion heat is required. The temperature at which any substance will catch fire is called the ignition point, which varies with the condition of the substance, the pressure of the air or the other gases involved, etc. When the savage rubbed two sticks together, he discovered without knowing it that the ignition point of wood is usually high, in other words, he had to use a good deal of muscle and create a good deal of heat before flames appeared. But the tip of a match has ordinarily a low ignition point, and the heat created by simply scratching it once is enough to set up combustion.

The ignition points of some vegetable and animal oils are very low. They oxidize so rapidly as to generate a great deal of heat, and if kept in a confined place will spontaneously take fire. Many fires are caused by the spontaneous combustion of heaps of rags, paper, woollens, and other substances strongly impregnated with oil. Coal, charcoal, and green hay stored in large piles sometimes generate heat enough to cause spontaneous combustion.

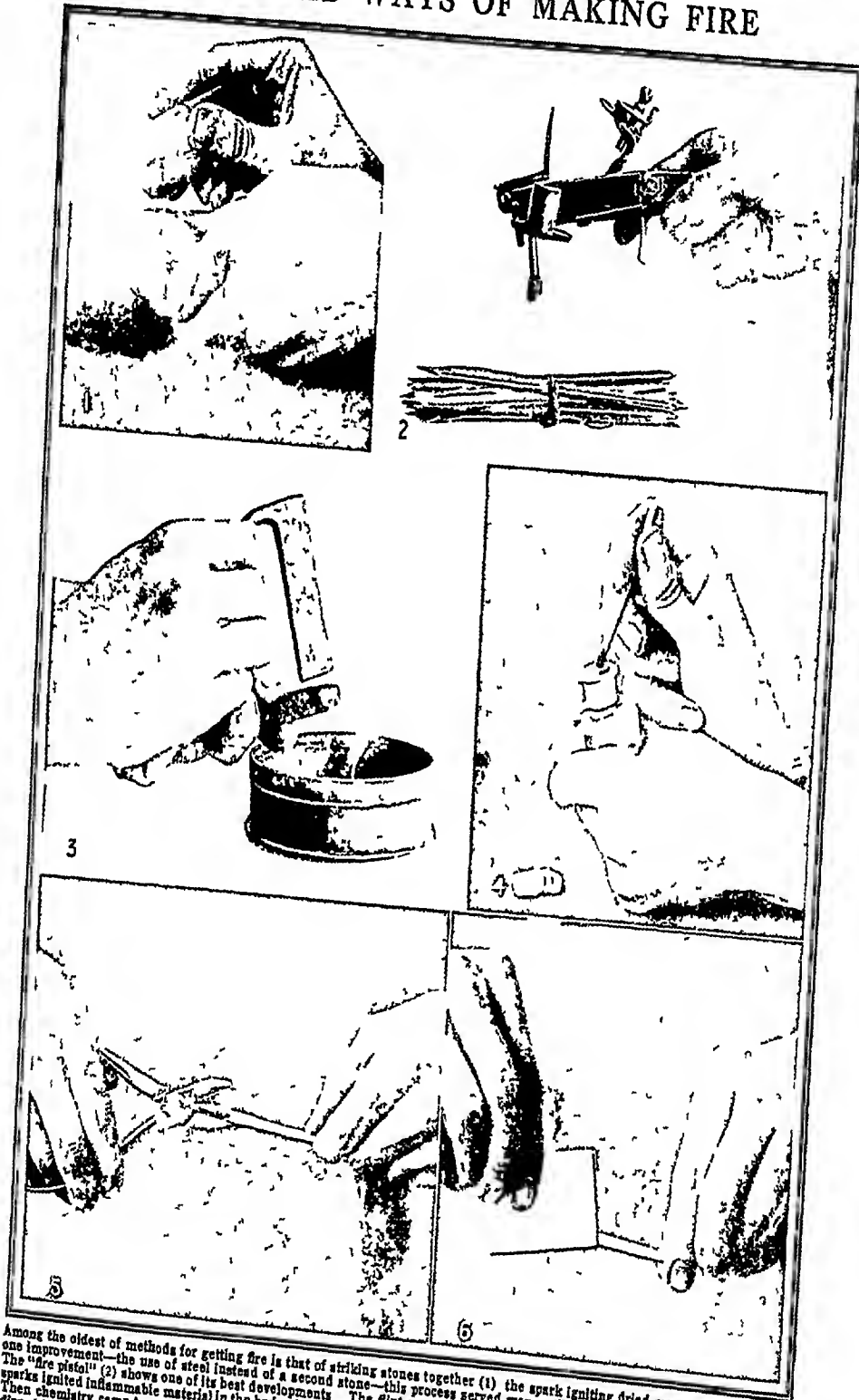
## Why a Fire 'Keeps In'

Thus we see how a fire is started, but what makes it keep on burning? The answer is one of the most important laws of fire. In scientific language it is this: A fire will be self-supporting only when the temperature created by the combustion of the burning substance is as high as or higher than its ignition point. Some very hard woods, like ebony, for instance, require a great deal of heat to burn them. If you put the end of a stick of ebony in a coal fire it will burn, but when you draw it out of the fire the smouldering ebony itself is lower in temperature than the ignition point of ebony, and so the flames go out.

This principle explains why you can blow out a match. Your breath carries away the heat until the temperature falls below the ignition point of the match stick. The stream of water from a fireman's hose cools the burning walls of a building with a similar result.

The heat of a fire depends upon the speed with which chemicals combine with oxygen. This speed in turn depends generally upon the

## SOME OLD WAYS OF MAKING FIRE



Among the oldest of methods for getting fire is that of striking stones together (1) the spark igniting dried moss or leaves. With one improvement—the use of steel instead of a second stone—this process served man until approximately a hundred years ago. The “fire pistol” (2) shows one of its best developments. The flint was struck against steel when the trigger was pulled, and the sparks ignited inflammable material in the body of the “pistol.” It was tipped with a substance which ignited when the match was dipped in acid. Then chemistry came to man’s aid with the first match (4). The ordinary flint and steel (3) is a less complicated arrangement. The old “promethean match” (5) used the same principle, but the acid was contained in a tiny phial which was crushed with pliers. The first real match—the so-called “inifer” or friction match—was invented in 1827, and was ignited by drawing the head through folded sandpaper.

## FIRE

quantity of oxygen present. If we take a bit of iron wire and put a match to it, it will not burn. But fasten the tip of a match to the end of the wire, strike it, and plunge it quickly into a jar of pure oxygen. The wire will catch fire and burn, with sparks shooting off briskly.

There are two kinds of fire, one with and one without flame. The presence of a flame always indicates that the heat has first forced a gas from the burning substance, and that this gas in turn combines with the oxygen in the air. When a coal fire flames, it is because gas is being forced out of the lumps of coal. By heating the coal in kilns in the absence of air, so that it will

The brightest flames are not always the hottest. Hydrogen, which combines with oxygen when burning to form water, has an almost invisible flame, even under ordinary circumstances. When it is pure and the air around it is completely free from dust, the hydrogen flame cannot be seen even in a dark room, though it is one of the hottest of fires.

When an inflammable gas is mixed with air in exactly the quantities necessary for complete combination, it will burn so fast as to create an explosion. This is what takes place in a petrol engine. The carburettor provides the air mixture and the electric spark sets it on fire. (See Internal Combustion Engine, Electricity) The occasional small explosions after the burners of a gas stove are turned off are due to the same fact. A little gas is left in the pipe, more and more air creeps in through the air valve until the mixture becomes explosive, and the tiny flame remaining on the burner thereupon "fires back."

### Setting Fire to Air

A substance is called inflammable when it can be ignited in the air under ordinary circumstances. But what would you say if you were told that air itself is inflammable under certain conditions? All you have to do is to reverse the process of a gas-stove. If, instead of having gas in the pipes and air outside, you had air in the pipes and gas outside, you could light the stove and cook with it just the same, for the combination of gas and oxygen would be equally effective. So, if men lived in an atmosphere of coal-gas, we would be paying to have air laid into our homes for our cooking. Thus, when we say that some things will burn and others will not, we must remember that such a statement always means "in ordinary air."

Fire-worship and legends associated with the origin of fire have existed since the earliest times. In many cases fire-worship was associated with sun-worship, and fire was regarded as the earthly representative of the sun god. A common feature of such worship was that of preserving "sacred fires" in the temples.

The Prometheus legend and the religion of Zoroaster have already been referred to at the beginning of this article. The latter, known also as Persian sun-worship, is of extremely ancient origin, but persists to this day. When the Parsees fled from Persia to India in the 8th century, they carried with them their sacred fires, which are said to have been kept burning ever since.

North American Indians attributed the origin of fire to various animals which, according to tribal legends, first showed their far off ancestors how to make it—the buffalo by striking sparks from stones with its hoofs, and the panther by scratching the rocky hillsides with its sharp claws.



### HOW A 'BLACKFELLOW' MAKES FIRE

This Australian aboriginal is engaged in making fire by one of the most primitive methods. He twirls between his palms a stick, the end of which fits into a small hole in a block of wood. The friction caused by the rapid rotation of the stick eventually creates a flame.

not catch fire, this same gas may be extracted and stored for future use in gasometers. The coke, which is left after the gas is extracted from the coal, burns without flame. In this case the oxygen combines directly with the carbon in the coke to form carbon monoxide, which burns with a bluish-red glow.

It is the gas given off by the heated wax in a candle which produces the bright flame. To prove this, blow out a candle which has been burning for some time. A thin ribbon of smoke will arise. Pass a lighted match through this smoke an inch above the wick. A tiny flame will run down and light the candle again.

## From ARQUEBUS to Magazine RIFLE

*Perhaps at your school you are taught to shoot. Then when next you hold your rifle, remember that it is yet another example of evolution—that it is the direct descendant of the guns whose story is told here*

**Firearms.** The first hand-gun ever used was a rough metal tube about 3 feet long, closed at one end and fastened to a straight stick. It was loaded through the muzzle with crude gunpowder and bits of stone or metal. One man held it firmly braced under his arm. Another applied a fuse, or "match," of smouldering tow to a touch hole near the breech.



Musketeer of 1609

The gun went off with a tremendous roar, a burst of flame and a great cloud of smoke. If the enemy was not more than a hundred feet away, a few might be slightly wounded. But the gun was just as likely to blow up and kill the men who operated it.

Now look at today's direct descendant of that ancient hand gun. It too has a metal tube, called the barrel, fastened to a wooden "stock," or handle. It too is loaded with powder and bits of metal. The principles are exactly the same, but see what a difference in its performance! The marksman holds the wooden butt tight to his shoulder, takes aim through the sights, and presses a small trigger. Almost instantaneously, swifter than sound, the bullet has reached half a mile away, penetrating a steel plate a quarter of an inch thick!

Between the 15th century hand gun and the rifle of the twentieth century an almost infinite variety of ingenious and interesting firearms developed out of men's keen competition in warfare and hunting were evolved. Here we can only trace

briefly the mechanical development of "small arms"—muskets, rifles, shot-guns, revolvers, pistols—leaving the history of artillery and machine-guns to separate articles. (See Artillery, Explosives, Machine-gun)

When the first hand-gun was given a curved stock with a wide butt to be placed against the shoulder, it was called a "hackbut," or "arquebus." This was soon improved by fixing a hammer on the gun to hold the taper or match, which was brought down to the touch-hole by a trigger. Weapons equipped with this device were called "match-locks." They were clumsy arms, quite useless in rainy or windy weather, and not nearly so rapid and effective as the long bow and cross-bow at their best.

About 1540 the Spaniards developed a longer match-lock, with a bore a little larger than that of the standard modern shot-gun. This was called a "musket," a term which came to be applied to all military hand-guns up to the time of the rifle. The early muskets were so heavy that they required a support, and musketeers

carried long forked rods which they planted in the ground in order to support their weapons while they fired. Muskets were usually loaded with a single round bullet of lead, which was forced down against the powder with a ramrod.

Early in the 17th century the "flint-lock" was invented, which made the burning fuse, or "match," unnecessary. The hammer, operated by a spring, had a head like a vice, which held a piece of flint. Around the touch hole on the side of the barrel was a priming pan with a hinged cover, which had an up-thrust wing of furrowed steel. When the trigger was pulled, the hammer fell and the flint struck the winged cover and opened it, sending a shower of sparks to fire the powder in the pan beneath. The



**DANGEROUS—BOTH ENDS!**

These 15th-century soldiers are discharging a form of "hand cannon." Aiming with the left hand, the gunner applies a taper, or "match," to the hole bored through the metal cylinder and so fires the powder. Altogether a most dangerous business for the man behind the gun!

British Museum



## FIREARMS

flashing of this priming powder through the touch-hole set off the charge in the barrel

With the flint-lock musket, which preceded the short bell mouthed "blunderbuss"—the forerunner of the shot-gun—the Puritan Fathers, when they first landed in America, overcame the Red Indians. This type of musket was the "Brown Bess" of the British infantry for more than a century. With it were fought the battles of the French Revolution and the Napoleonic wars.

A Scottish clergyman named Forsyth first patented the use of fulminates for firearms in 1807, and during the first half of the 19th century the percussion cap for igniting the powder slowly replaced the flint-lock. This system depended on the fact that certain explosives, called fulminates, were set off when struck a sharp blow. In percussion cap guns a nipple was set perpendicularly in the breech and on this was placed a small copper cap containing the fulminate. The cock or hammer, when released by the trigger, struck and exploded this cap, sending a jet of flame into the powder.

But the old musket had always suffered from two great defects. The round bullets had to be of large diameter, or calibre, to produce the required weight and striking force, and hence air resistance slowed them down very rapidly. Also, they began "rolling" as they passed out of the smooth bore barrel, making them "curve" to a degree that made accuracy impossible beyond a hundred yards.

### Advantages of Rifled Barrels

To overcome these defects the principle of rifling was adopted. This consisted of cutting spiral grooves or ridges inside the barrel to grip the bullet as it passed through and give it a corkscrew spin. The rifling put an end to erratic flight, and eventually permitted the use of long cone shaped bullets, thus giving the projectile greater weight without increasing air resistance. The spinning motion kept the points of such bullets forwards, instead of allowing them to turn end-over end.

Although the principle of rifling was discovered in the 16th century, no great use was made of it for 100 years. Not until the idea was further developed in the long small bore guns of the backwoodsmen of the American colonies did the rifle become a truly effective weapon. In the War of American Independence the British experienced the long range and deadly accuracy of such rifles, and they brought the lesson back to Europe.

The rifles were loaded from the muzzle with round bullets wrapped in a "patch" of greased linen or buckskin, but even so, it was a slow process to force the bullets home down the grooves, and the smooth-bore musket with its loosely fitting ball continued to be the chief

military weapon for this reason. As for the cone-shaped bullet, the increased friction of its long sides made its use next to impossible in the muzzle-loader, until the invention of the famous Minie ball (adopted about 1852 in Europe), which fitted loosely at loading and expanded to fit the rifle grooves when fired.

### Breech-loading Rifles

But it was not until the breech-loading principle came into use that the rifle could rival the smooth-bore in speed of operation. In 1810 John H. Hall, an American, had invented a breech loading flint-lock rifle, with a hinged chamber at the breech which tilted upward to receive the powder and ball, and then dropped down opposite the opening of the barrel. This device, however, allowed a great leakage of powder gases, as did the revolving-cylinder rifle invented in 1836 by Samuel Colt.

The first successful military breech loader came with the use of cartridges, which contained in one paper package the powder and the bullet, and so could easily be inserted into the breech after tearing off a corner with the teeth to expose the powder to the fire from the percussion cap. The Prussian "needle gun" was among the earliest military types of cartridge firing breech-loaders, and with it the Prussian armies were able to overwhelm the Austrians in 1866. The adoption somewhat later of copper and brass cartridge shells stopped virtually all gas leakage at the breech, for the shell expanded on explosion, tightly sealing the breech opening.

The first metal cartridges were of the "rim fire" type, that is, they were exploded by a blow of the firing pin on the outer rim, beneath which was the fulminate. These were soon displaced, in all except the smallest calibres, by the "centre fire" cartridges of today, in which the cap occupies a small pocket in the base of the brass shell.

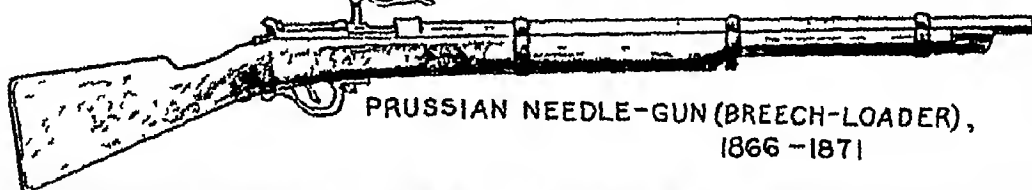
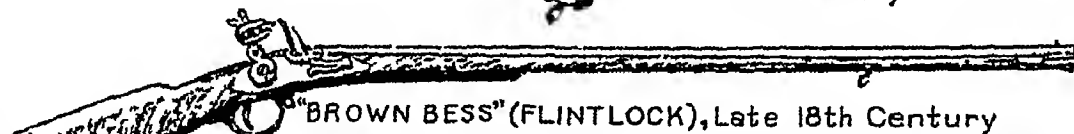
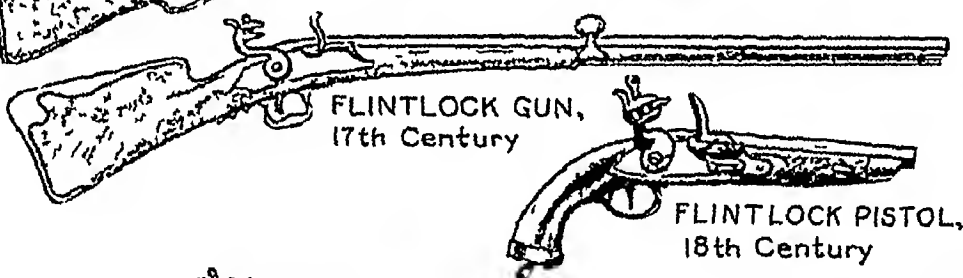
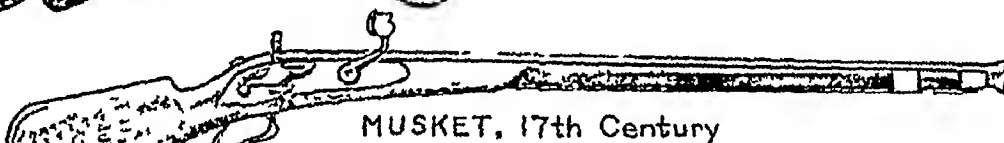
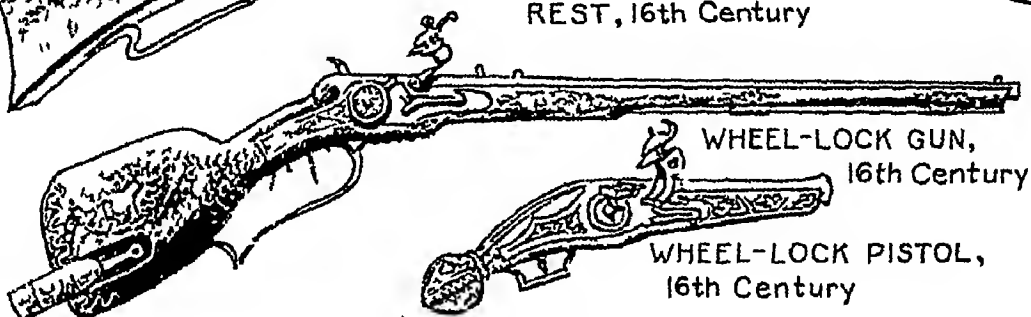
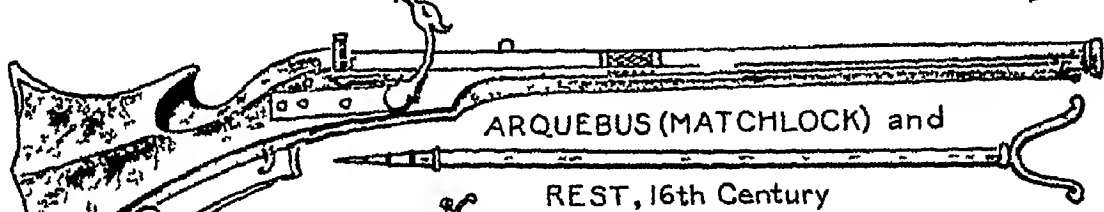
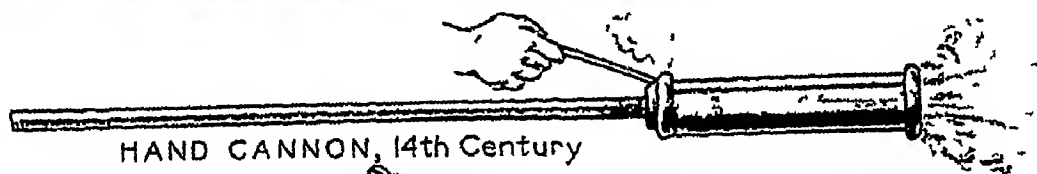
### Rifles with Magazines

The breech mechanism of cartridge guns was early equipped with an ejector which cast out the empty shell when the weapon was opened for reloading. It was a simple step to add a magazine in which several cartridges could be placed, with a device for bringing them successively into the proper position in the firing chamber, so that as fast as one was fired and ejected, another would be thrust in. This gave us the various types of repeating rifles. Others had box magazines of the Mauser type, in which the cartridges lie one above the other in a compartment at the breech—as in modern rifles.

It remained only for the arrival of smokeless powder to bring rifles to their present height of shooting power (See Gunpowder). The increased pressure of the new powder, however, caused the old soft-lead bullets to jump the rifling, and so

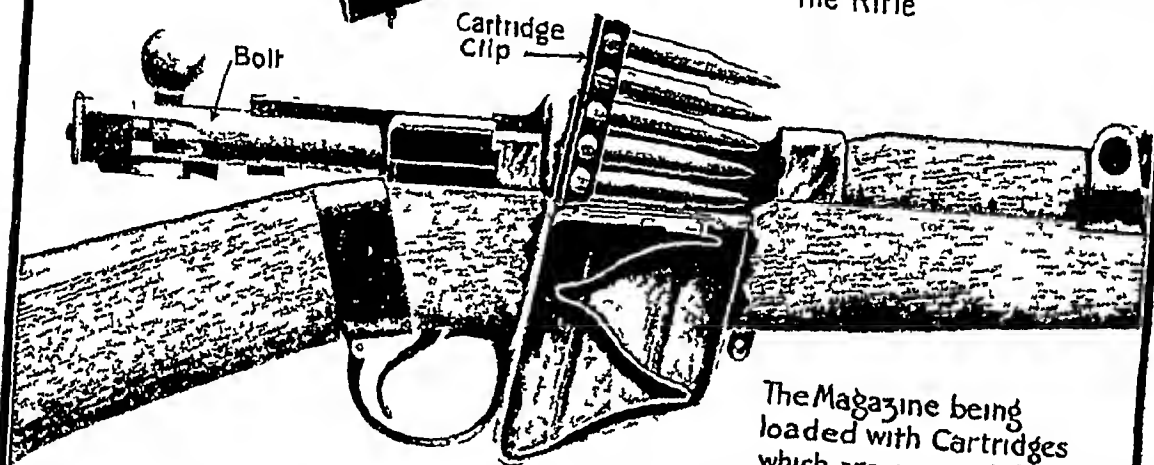
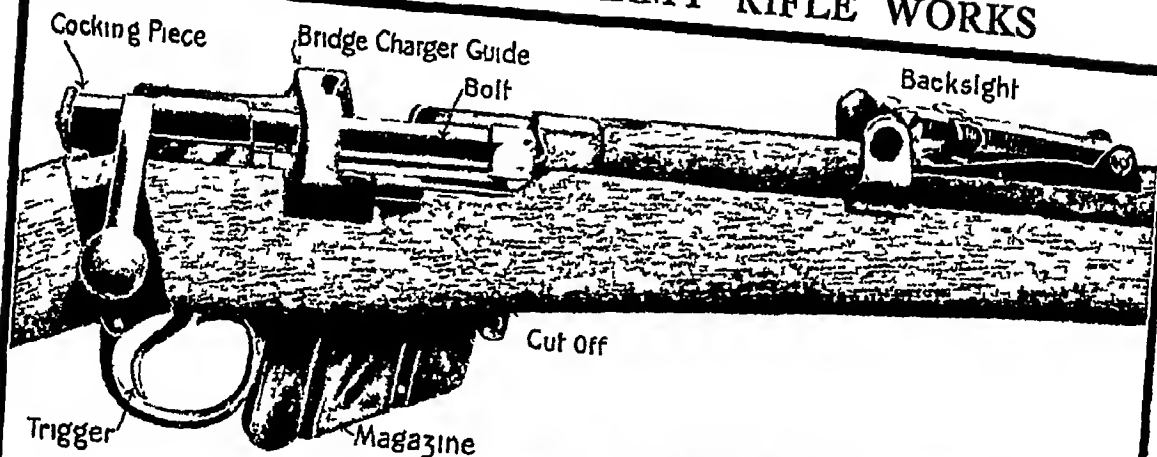


# THE FAMILY TREE OF MODERN FIREARMS

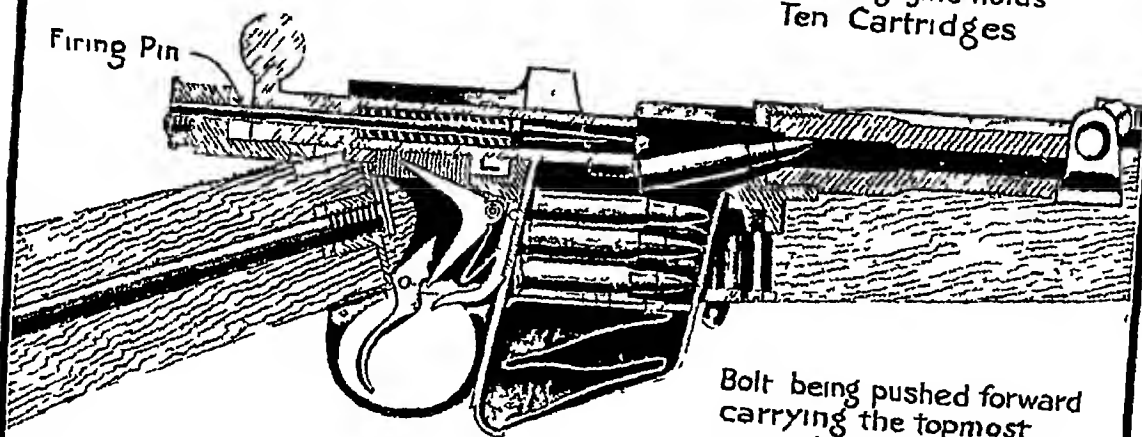


Five hundred years of firearm history are shown above, and we notice four great developments from the original "Hand Cannon." The "Hand Cannon" was just a tube, ignited with a red-hot iron applied to the "touchhole," and supported by holding the stick under the arm. The Arquebus changed the stick to a stock held against the shoulder, lengthened the tube and provided a mechanism for applying a burning "match" by pulling a trigger. It was supported on a metal fork. The next six weapons, including the famous "Brown Bess" of Wellington's armies, used the flintlock for firing. The Springfield gun of the 'sixties introduced rifling and percussion cap ignition, which was also followed by the revolver. The Prussian Needle-Gun established breech loading.

# HOW A MODERN ARMY RIFLE WORKS



The Magazine being loaded with Cartridges which are pressed down into it  
The Magazine holds Ten Cartridges



Bolt being pushed forward carrying the topmost cartridge into position for being fired

The distinguishing feature of nearly all military rifles today is the bolt action and magazine loading. Here we see the famous Lee-Enfield rifle, which was first used by the British troops in the South African War of 1899-1902 and, slightly modified in the World War. At the top the details of the breech are shown. Beneath is the complete rifle. The middle picture shows how the cartridges are loaded, five at a time in clips. At the bottom you see the bolt thrusting a cartridge into position.

brought about the invention of the hard metal jacket for bullets. This jacket, composed of steel or of an alloy of copper and nickel, gives the bullet so secure a hold on the rifling that a much sharper twist is given, imparting to the bullet a much more rapid spin and greater muzzle velocity. This, in turn, makes possible the use of longer and narrower bullets, which can be driven to great distances at very high speeds. The standard rifle in the British Army has been, for many years, the short magazine Lee Enfield of 303 in calibre.

The crowning achievement of rifle construction is the self-loading weapon, commonly called the "automatic." In these guns the recoil is used to operate the mechanism, so that the cartridge is fired, ejected, and another put in its place by pulling the trigger.

#### Development of the Pistol

The early pistol was simply a gun small enough to be fired with one hand. The pistol's development followed step for step that of the musket. The first great departure in pistol-making came with the invention of the revolver, which had a revolving cylinder containing five or six charges of powder and ball which could be fired in rotation through the same barrel. The self-loading, or automatic, pistol, however, has superseded the revolver entirely. Capable of firing from eight to ten shots with extreme speed, it is superior in mechanical principle to the revolver, for in the latter there

is always imperfect alignment and gas leakage at the junction of the barrel and the cylinder.

As early as 1580 fowling pieces seem to have been made for the purpose of shooting at flying birds. Blunderbusses, with yawning barrels loaded with small shot or bits of metal and stone, were used as "scatter-guns" in battle or for defending stage coaches from highway-men. Out of these grew the modern shot-gun, whose development followed closely that of the musket and rifle.

#### Shot-gun Bores and Cartridges

Modern shot guns have barrels ranging in size from 8-bore to 24-bore, a system of measurement which has come down from the days of the musket. The standard 12-bore gun, for instance, is one whose barrels are large enough to accommodate a round leaden ball of such a diameter that 12 of them would weigh a pound.

Shot-gun cartridges for breech-loaders, usually made with a brass base and paper sides, may be loaded with any size shot, from the tiny pepper-shot used on small birds to the heavy buck-shot for deer and other large animals.

"Choke-boring," by which the barrel is made slightly narrower at the muzzle, causing the shot to fly in a closer group and thus be more effective at long range, is the chief device which has improved the shooting qualities of these guns since the days of the old fowling pieces. The standard double-barrelled shot-gun is often made with one "choked" barrel and one open

## FIGHTING FIRE *in* TOWN *and* COUNTRY

*Who is not thrilled at the sight and sound of a fire-engine thundering through the streets with bell ringing and men donning their helmets? Here we are told something of the fireman's dangerous life*

**Fire Fighting.** Ever since men began to build homes for themselves they have had to guard against the dangers of fire. More than 4,000 years ago the Egyptians had an organization for dealing with outbreaks, and as long ago as 40 B.C. Rome had the equivalent of a modern fire brigade.



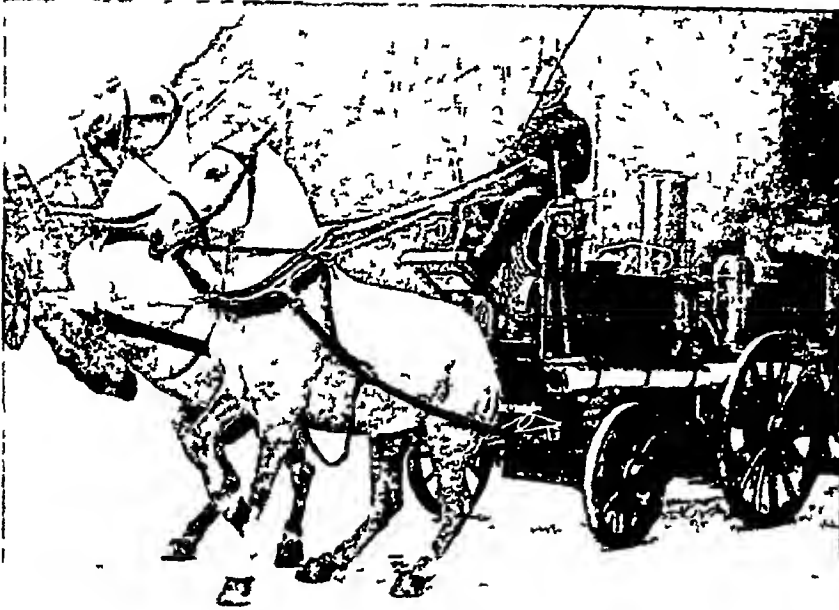
Fighting a forest fire  
Canadian National Railways

The first regular fire brigades in England came into being in 1774, when an Act of Parliament imposed upon the churchwardens of all the London parishes the obligation to provide a fire engine to deal with outbreaks within their own boundaries. The first fire brigade for the

whole of London was formed by the London insurance companies in 1833. It was under the command of James Braidwood, to whose orders the first steam fire engine was built. In 1866 the Metropolitan Board of Works, which governed London before the London County Council, took over the protection of London from fire and organized the fire brigade. Since then the London Fire Brigade has grown greatly in numbers and efficiency. In 1937 it had 60 fire stations on land, and three stations on the Thames, each of which was provided with a powerful fire-float to deal with riverside fires. The uniformed staff numbered 1977, and there were 198 motor appliances, including a travelling canteen. About 5,000 fires a year are dealt with by the London Fire Brigade.

In July, 1937, King George VI, accompanied by Queen Elizabeth, opened large new headquarters at Lambeth, one of the most completely equipped fire stations in Europe. Besides fire-fighting equipment, provision is

## FIRE FIGHTING



### FIRE ENGINES SUCH AS WE USED TO SEE

This horse drawn vehicle contrasts very strangely with the high-powered, pneumatic-tired motor fire-engine of today. The horses were well-trained and powerful animals, but the equipment was poor. The engine carried a steam boiler and one or more steam driven pumps.

made for training and instructing firemen, while from the control room, furnished with every known mechanical device, the operations of all fire stations in the county of London are controlled and co-ordinated.

All the great cities of the United Kingdom now have up-to-date fire brigades, staffed by professional firemen, and practically every borough and urban district has its own fire station. In some of these districts only a nucleus staff of professional firemen is employed, supplemented by volunteers who are only called together for outbreaks of fire and for weekly drills. In country places the fire brigade is often entirely composed of volunteers.

If you want to know how quickly a fire brigade can get to a fire, visit a large fire station some night when a call is received. There you will see a man sitting at a desk under an electric light, and another man reading. This is the night watch. The big motor engine with its shining

brass gleams in the light. Overhead, the firemen are asleep, half-dressed. Brass poles set in big rubber pads go up through manholes to every floor. You wonder what these are, but not for long.

Suddenly the brass gong strikes. That is the "forward charge!" for "your" fire station. No need to shout orders. Everyone turns out in response to the bells rung in the various bedrooms by pulling a single switch. The firemen drop through the holes and slide down the poles. The driver starts the motor, and with a clang and a roar—away the fire engine goes on its job in less than a minute!

Clang! Clang! rings the bell. Clear the streets, get out of the way! The man on watch has shouted the number of the fire alarm the bell. Clear the streets, get out of the way! The man on watch has shouted the number of the fire alarm the

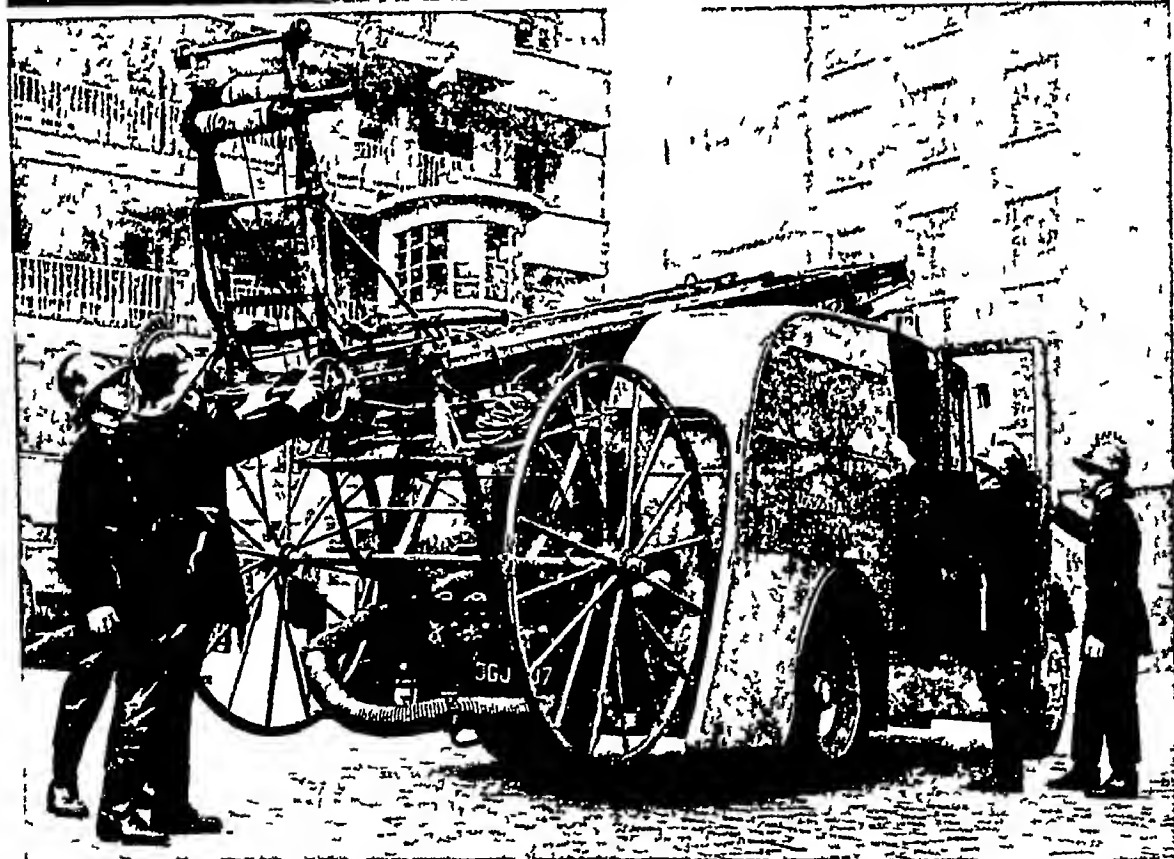
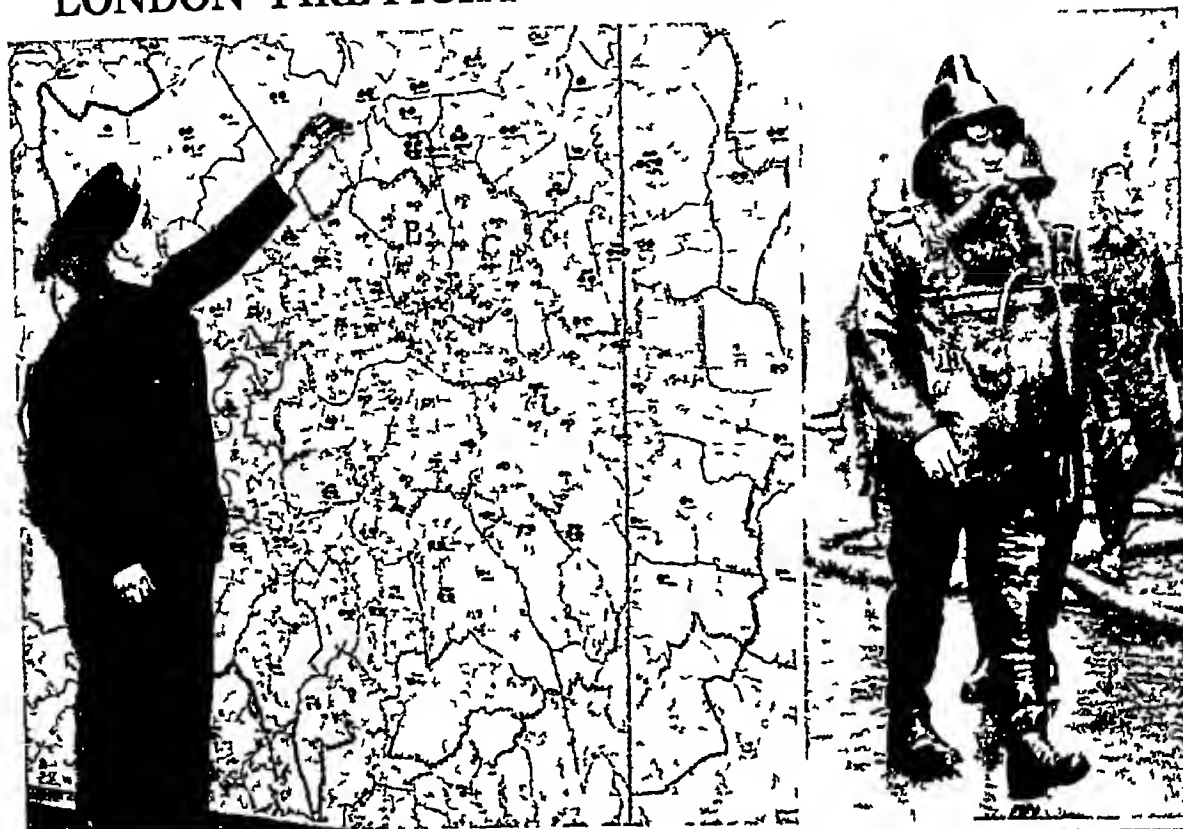


### 'FOAM' FIRE FIGHTER

Topical 1 rras

This picture shows firemen using a chemical "foam" generator to extinguish a fire caused by an explosion at a power station. The foam, which can be clearly seen, is very like dirty soap-suds and its action is to smother the fire.

# LONDON FIRE-FIGHTERS & THEIR EQUIPMENT



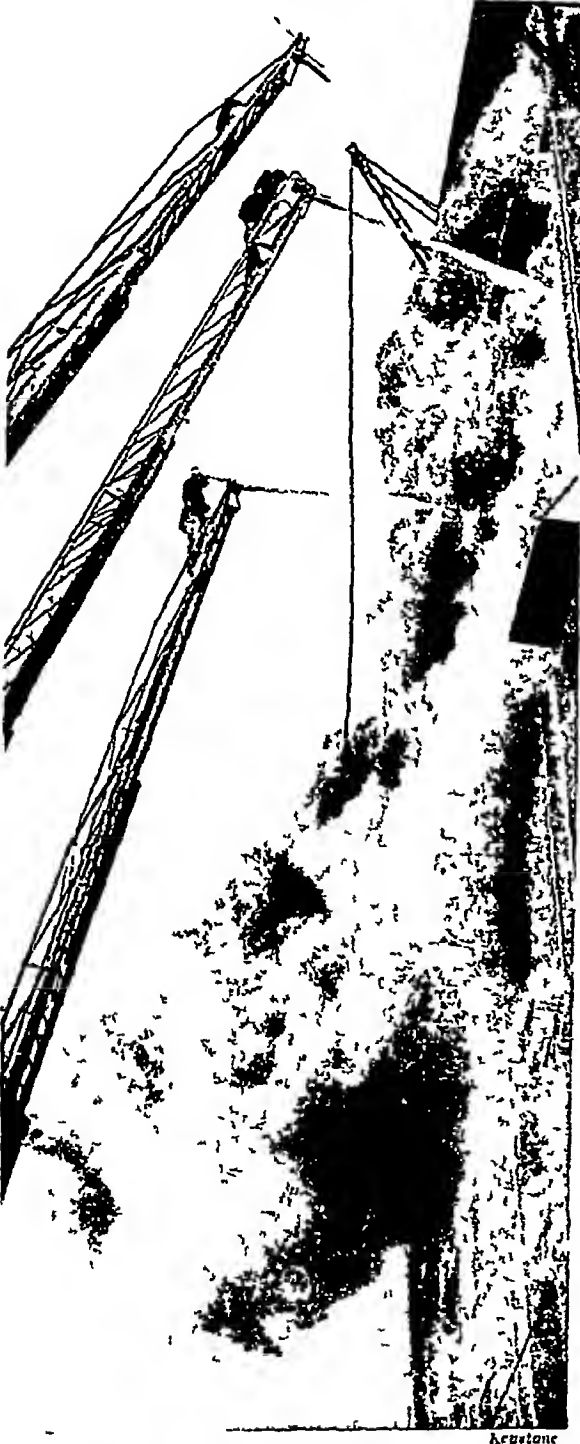
The top left picture shows how, by aid of the mobilizing map, the exact position of all brigade units within call of a danger area can be seen at a glance, and successively moved into service. In the right-hand picture firemen equipped with the latest breathing apparatus, are about to enter a burning basket warehouse. Below is a new type of streamlined 'dual-purpose' (pump and escape) fire engine recently adopted by the London County Council Fire Brigade. The crew travel in the enclosed body. The men are wearing cork and rubber helmets as a protection from 'live' cables.

*Photos Keystone Sport & General*



## FIRE FIGHTING

The first thing to be saved in a fire is life the second is property The motor fire escape is there as soon as the engine Firemen run up stairways and ladders to make sure that everyone is out of the burning building If they hear a scream or a moan, they break down doors and go right through flame and smoke to the rescue, saving lives, with no thought of their own danger



### TURN TABLE LADDERS IN ACTION

These steel ladders comprise a main ladder with extensions which increase its height up to 100 feet The fireman stands on a small platform and directs the hose-nozzle on to the fire



Topical 1 1931

### WALKING UNHARMED THROUGH FIRE

The Royal Air Force has developed a number of new methods of fire fighting, especially for rescue purposes Here you see two aircraftmen demonstrating the fireproof qualities of asbestos suits They are standing in a pool of flaming petrol

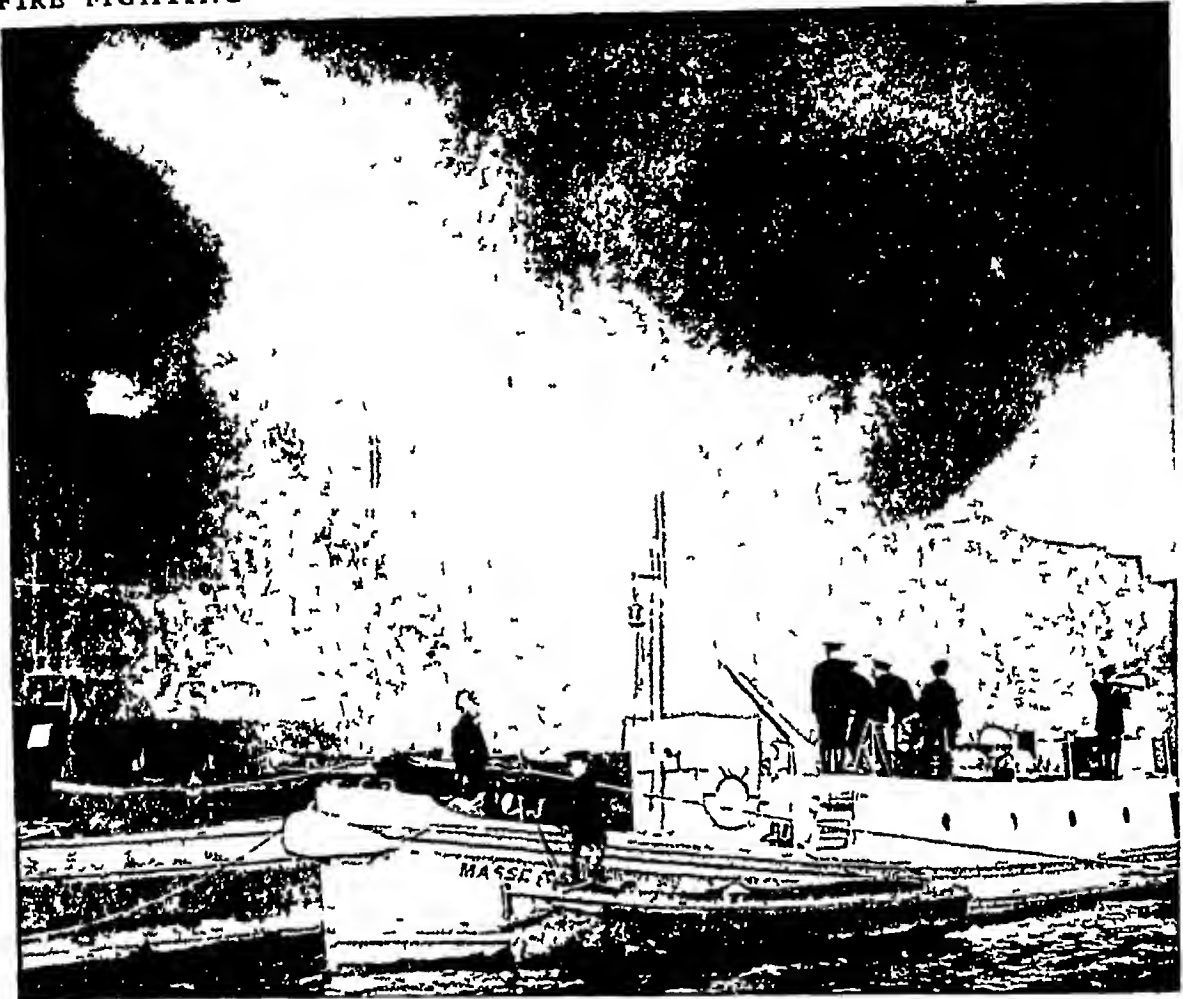
There are few sights more thrilling than to watch a fireman carrying terrified or unconscious people down a long, shaking ladder Through the smoke you see firemen creeping along dizzy ledges where you would think a cat could not go They climb on roofs and drop through skylights They make bridges across alleys and courts with ladders, they hang over roof copings Every day firemen do deeds of daring that you would think impossible, without fuss or thought of glory

### Dangers of the Fireman's Life

These brave men are sometimes killed, or injured for life Burning shutters, copings, and windows fall upon them Sometimes a roof falls in upon them, or an explosion blows up a building More than once an upper floor has fallen into the basement, carrying the firemen with it Smoke and poisonous fumes often render firemen unconscious

It is important that the firemen should reach the fire quickly In bygone days messengers ran through the streets calling "Fire!" or a central alarm bell was rung, as is still done in villages and small towns The volunteer fire fighters tumbled out helter skelter, and much time was lost in finding out where the fire was





**FIRE FLOAT IN ACTION ON LONDON'S RIVER**

At wharf fires especially, when the danger area may be on the waterside fire floats are indispensable. The picture shows one in action, shooting a spray of tremendous force on to the flames. This latest float used by the London Fire Brigade can project 1,000 gallons of water per minute, but there is no difficulty in finding water, for it is drawn out of the river. Sometimes a line is shot from the float to the shore in order to provide a means of drawing the hose over projections.

Then cities were divided into districts, and when the fire bell rang a man on a high tower indicated, by flags in the daytime and by lanterns at night, in which district the fire was. Later, electrically operated fire alarm systems came into vogue, and now you see fire alarm boxes placed at convenient intervals in the streets. These usually contain keys which, when turned, record on a moving tape in the fire station the number of the box from which the call is being sent. As soon as the call is received, the firemen turn out and rush the engine to the call box to be told the exact position of the fire.

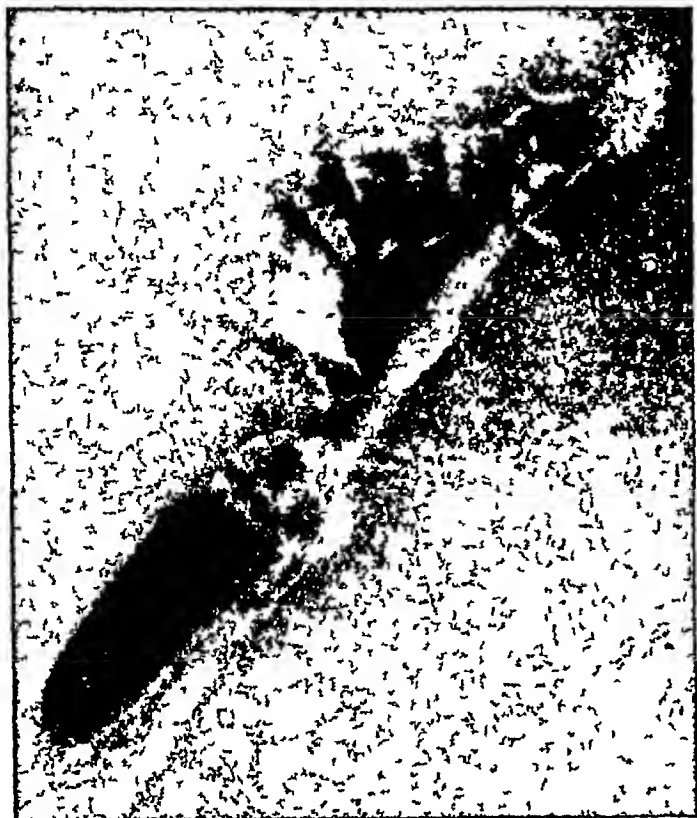
Great fires which nearly destroy whole cities have now become rare. Better methods of fire prevention and new means of subduing fires have greatly reduced the risks, as also have improved building materials. Formerly fire was one of the great scourges of large towns all over the world. In 1666 the Great Fire of London consumed all the buildings on 396 acres, destroying 13,200 houses and ninety churches.

In Moscow 18,000 houses were burned in 1753. One of many fires in Constantinople occurred in 1729, destroying 12,000 houses and 7,000 lives. Copenhagen was nearly destroyed in 1728, and in 1842 a fire lasting for 100 hours destroyed more than 4,000 buildings in Hamburg.

**Fireflies AND GLOW-WORMS** The most wonderful lighting system in the world is that possessed by the fireflies and glow-worms with their "phosphorescent" lights.

Fireflies—which are not "flies" at all, but beetles—have been objects of wonder and romantic stories in all ages. Flitting about on warm evenings, or creeping in the damp grass, these "living stars" with their pulsating light produce a weirdly beautiful effect.

Certain large and brilliant fireflies of tropical America, called "cucujos," are captured by the natives and kept in wire cages, where they are fed on sugar-cane and bathed twice a day in tepid water. On festival nights they are sold to the young women of the district, who thread them together and weave them in their hair or



#### MR AND MRS GLOW WORM

Here is a wonderful photograph from a film of the glow worm's life. At the top of a twig is the female glow-worm with her bright light glowing on the tip of her body. Below her is her mate—and you can see that he is really a very ordinary little beetle—attracted by the light.

*British Instructional Films Ltd*

fasten them to their dresses, to glow there like flaming jewels.

The glow worm (*Lampyrus noctiluca*), which is chiefly a native of Great Britain and northern Europe, is also a beetle. The female is wingless and crawls about at night among the grass. Her "lantern" consists of paired masses of fatty tissue beneath the skin on the under side of the abdomen. It is of this beetle that the ghost in "Hamlet" speaks when he says

The glow worm shows the matins to be near  
And gins to pale his uneffectual fire.

Naturalists have criticized Shakespeare for these lines, pointing out that he should have used the feminine "her" in referring to the glow-worm, and that the light is by no means "uneffectual," since it attracts the males, which fly to their mates. The food of the glow-worm consists of snails.

Among the true fireflies, both males and females have wings and lights. Besides their use as signals to each other, the lights are believed to be useful in warning night birds against gobbling down these insects, for they seem to have a very unpleasant taste and most birds as well as bats leave them alone.

Scientists have puzzled for centuries over the nature of these insects' light. It seems to be caused by certain chemicals in the fat tissues,

which become luminous when combining with the oxygen drawn in through the breathing tubes at the sides of the body. But all efforts to reproduce an artificial light of similar quality and brilliancy have failed.

**Fire Protection.** It is most important for every one of us to know how to take precautions to prevent a fire breaking out, and what to do if, by chance, there is an outbreak. On the opposite page are little pictures indicating seven ways in which it is only too easy to cause a disastrous fire, and these pictorial "don'ts" are by no means all the occasions which call for the exercise of a little care and common sense.

One way of preventing fires is by the use of fireproof materials. When we say that a building is "fireproof" we mean that it is built of steel, stone, brick, cement or some other material that does not burn, or more often that it is only slow-burning because of slate or tile roofs and asbestos linings, or is made of wood that has been chemically treated with silicate of soda or borax or phosphate of ammonia. Wood so treated will stand terrific heat, though it will ultimately char or burn.

Cloth can also be rendered fireproof. The same Englishman who made the first coal-tar dye, Sir William Perkin, made many experiments in trying to make flannel resistant to flame. He succeeded so well that the heat of a match is scarcely sufficient to ignite a piece of flannel treated by his method. The process consists in dipping the cloth in a solution of different chemicals so that an insoluble compound of tin is formed, or precipitated, as a chemist would say, in the fibre of the goods. Sodium tungstate is also used instead of the tin compound.

Where there is more than usual risk of fire, a chemical fire extinguisher should be kept handy. Certain gases, especially carbon dioxide (carbonic acid gas), "smother" a fire just as water quenches it, by preventing it from getting the oxygen which it needs in order to burn. Hand extinguishers usually consist of a metal container partly filled with a solution of bicarbonate of soda. In the upper portion of the cylinder is a glass container filled with sulphuric acid and corked with a loosely fitting stopper. In case of a fire, the cylinder is turned upside down, thus pouring the acid on the carbonate. At once carbon dioxide is formed, which "charges" the liquid just as the same gas charges soda-water. When a valve is turned the pressure of this carbonated liquid forces it through the nozzle of the hose.

# SOME "DON'TS" FOR THE PREVENTION OF FIRE



**DON'T** play carelessly with your crackers or squibs or other Fifth of November fire works. Serious personal injuries as well as great damage to property may be caused by fire works that are not carefully handled.



**DON'T** play with matches especially near inflammable material. Matches are always dangerous playthings. It is a foolish household that leaves the waste paper basket near the gas stove or fire because a burning match carelessly thrown away or a spark from the fire may ignite the dry paper.



**DON'T** light up a dark cupboard or search for a gas leak with the light of a match.



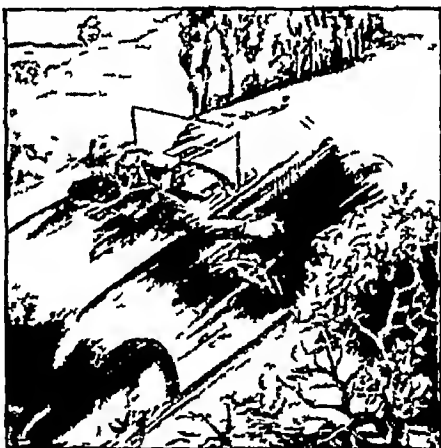
**DON'T** use inflammable cleaning fluids in a room with a fire burning. Most preparations for dry cleaning give off a gas which takes fire readily.



**DON'T** let the electric iron stand with current turned on while you engage in a long chat on the telephone. It is also a dangerous practice to loop electric wires over a nail as the rubbing of the wire on the nail may remove the insulation and start a fire.



**DON'T** let anyone drop a lighted cigarette along the highway. It may start a fire in dry grass or undergrowth which will destroy a wood.



**DON'T** leave the smallest ember of your camp or picnic fire burning. Put it out with water as these boys are doing and thus save all danger of the fire spreading.



## *FLOWERS of FIRE that BLOOM by NIGHT*



**Fireworks.** China is believed to have been the birthplace of fireworks. There and in India they attained high perfection. When gun powder was introduced into Europe, fireworks also came into use. As early as 1540 they were manufactured in Italy, and during the 17th and 18th centuries fêtes were held in which fireworks were used.

The brilliant colours of fireworks are due to certain bright-burning chemicals such as sodium, which gives a deep yellow colour, calcium, which gives red, strontium, crimson, barium, green, and copper, green and blue. Iron filings are used to create the showers of brilliant sparks.

In all fireworks there must be the ignition powder, which first catches fire, the explosive element, which causes the final explosion, and the fuse, which leads the spark of fire from one point to another. This fuse is made of cotton wick, which has been saturated in a paste of gunpowder and starch and dried.

The stars in Roman candles are hollow balls, made of gunpowder ingredients mixed with light giving materials, pressed into shape with the aid of gum or shellac, and resting on layers of loose granulated gunpowder. These balls are then evenly distributed through the cardboard case, the spaces between the balls being filled with a closely packed mass of slow-burning material. Catherine wheels are made by coiling long paper tubes, lightly filled with an explosive composition, about a round wooden frame which revolves freely on its axis.

### **Pirates Routed by Fireworks**

Fireworks have their useful side also. Once a brig lay becalmed off the island of Sumatra. It was loaded with a cargo of fireworks, for this was in the year 1840, when China manufactured most of the fireworks of the world.

In the mid-watches of the night came the terrifying cry, "Pirates! Pirates!" All hands swarmed on deck, only to find that no ammunition was available. The murder of the crew and the plundering of the ship seemed certain, for two war proas (Malay sailing vessels) were close at hand, filled with dark skinned cut throats.

The captain, in desperate desire for action, tore open a box of fireworks and began setting off Roman candles and rockets over the moonlit waters. The pirates stopped, perplexed, and when the leader of one of their vessels was hit by a ball of purple fire they drew off.

### **Rockets That Save Lives**

For many years rockets, Roman candles, and "Bengal" or coloured lights were used as signals between vessels at sea, with an elaborate code by which vessels could "talk" to one another at night. Rockets especially are used as signals of distress at sea, and many lives have been saved by lifeboat crews answering the call of "distress" rockets. During the World War of 1914-18 great use was made of rockets to signal to the artillery in the rear, telling the gunners when to begin firing and when to cease. "Star shells" fired from cannon were invented as a means of lighting up "no man's land." Exploding in mid air, they set free brilliant lights suspended by parachutes.

Firework displays were held at the Crystal Palace for many years until 1937, when the fire which burnt down the palace forced Messrs Brock, the organizers, to move to the White City. Great events or occasions of rejoicing are often accompanied by elaborate displays. For instance, few who witnessed it will forget the beautiful sight of fireworks bursting about the assembled Fleet at the Coronation Naval Review in May 1937.

# HOW THE ROCKET IS SHOT SKYWARD BY ITS TAIL



What sends the rocket roaring upward and scatters its beautiful stars across the dark night sky? The answer is easy. The body of the rocket consists of a hollow tube with a strong pointed cap. A plug holding a smaller tube fits into the bottom, confining the propelling charge of powder. When you light the fuse, the flame runs up and ignites this powder, and the gas of the explosion rushing from the narrow opening, drives the rocket up. It was long thought that rockets shot up by pushing back against the air but now we know they work better in a vacuum. Just as the propelling charge is exhausted, the fire flashes through a tiny hole at the top, igniting the powder which scatters the "stars." The stick guides the rocket in a straight line.



## FIREWORK FAIRYLAND OVER SEA AND LAND



The famous annual firework displays held in the grounds of the Crystal Palace (burnt out on November 30, 1936) have always been, as one might say, an "eyeful" and an "earful." We cannot reproduce the noise here, but the lower photograph gives some idea of the beautiful patterns traced out in paths of light and colour. The upper photograph presents a magnificent view of the British Fleet illuminated as a climax to King George V's Jubilee Naval Review held at Spithead on July 17, 1935. The battleship Rodney is seen in silhouette from the deck of her sister ship, H M S Nelson.

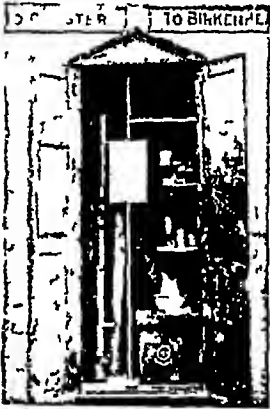
*Photos "The Daily Mail"; "The Times"*



# WHAT to DO before the DOCTOR COMES

*Everybody should be familiar with the principles of first aid, and here is a useful article giving clear and complete instructions for dealing with accidents and ailments that might occur in any household*

**First Aid.** Not long ago two boys were out camping. While chopping wood for a fire the younger one cut his leg badly, and the



St John Ambulance  
Road-box.

blood gushed out in spurts. The older boy came running to him, reaching down for a stone and twisting his handkerchief as he came. Quickly he knotted the handkerchief round the leg between the cut and the body, with the stone pressed down tight over the main artery of the leg. Then he cut away the stocking and cleaned the wound as well as

possible with a weak solution of iodine, and lightly bandaged it with another handkerchief.

When they got to a doctor, the older lad was praised highly. By knowing just what to do he had saved his friend's life.

This was a splendid thing to do, and it is a thing that every boy and girl should be able to do when the occasion arises. The information contained in this article will enable you to act quickly and intelligently in cases of emergency.

First-aid treatment is not by any means intended to take the place of that given by the doctor. But until he comes it is important that a broken bone should not do further injury to the tissues, that bleeding be stopped as quickly as possible, that an open wound be protected against infection, and that the patient be made as comfortable as possible.

First of all, in case of an accident, it is important that the patient should have plenty of air, and at the same time be kept warm. The patient should be moved as gently as possible, and if he is badly hurt it is much better to leave him where he is, provided he is not in a place of danger, until the

doctor arrives. Planks or shutters can be used for stretchers, but it is necessary that the bearers should keep in step in order to prevent jarring.

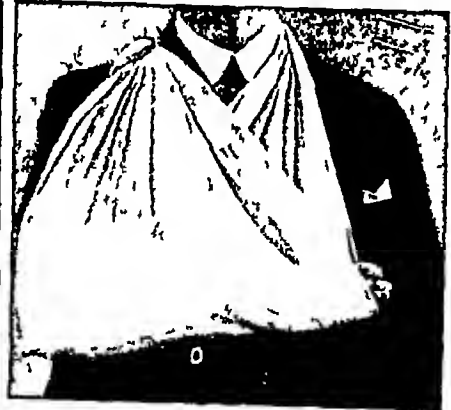
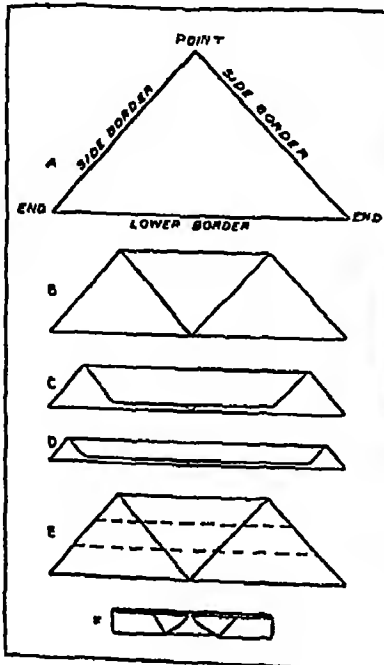
When nothing of this kind is available, a stretcher can be improvised by buttoning up two coats and slipping poles through the arms and along the sides. Such a stretcher, of course, should be thoroughly tested before using it, to make sure that it is strong enough.

When it is necessary to remove part of the patient's clothing, it must be done with care. In removing a coat, the uninjured side is taken off first. If necessary the stitches in the seam of the other sleeve can be ripped out and the coat lifted away.

Above all, keep in mind the most important rule in first-aid work "Keep cool." In not one case in a thousand are the few moments necessary to find out what is the matter with an injured man going to result in any harm to him. Common sense will tell you that there is no time to waste where there is severe bleeding, it must be controlled at once.

Splendid work has been done by the St John Ambulance Association to make more widely known the general principles of first aid. Its members may generally be seen on football and cricket fields and along procession routes where great crowds gather.

**BANDAGING** In all forms of injury bandaging is important. It holds dressings in place,



## BANDAGE AND SLING

Correct bandaging is one of the first things to be learnt in "first-aid," and here is illustrated the use of the triangular type. Left, to make a triangular bandage cut diagonally across a square of cloth (A). Fold twice (B and C, also dotted lines E) to get the 'cravat' form and for a thicker bandage fold in the ends (F). Above is the greater arm sling made with a triangular bandage.

## FIRST AID



### BANDAGING A FRACTURED JAW

Left, the centre of a triangular bandage, folded narrow, is placed under the chin and the ends are tied at the top of the head, just in front of the summit. Middle, a smaller bandage is applied to the front of the jaw and its ends tied at the back of the neck. Right, the ends of the bandages are then tied together across the back of the head.

supports the parts, and keeps the splints secure. When we have no proper bandages we must make use of whatever is at hand.

The simplest bandage, and the most useful in first-aid work, is the triangular bandage. This is made by taking a square piece of material 36 inches wide, and cutting it diagonally across from corner to corner. Such bandages are used either folded or unfolded. When folded repeatedly on themselves they are known as cravat bandages, and are very useful in holding the dressings firmly in place.

Folded or unfolded, the triangular bandage may be used on any part of the body. Smaller triangles are used for the hands and feet. Emergency bandages of this type may be made with a large handkerchief folded diagonally.

**ROLLER BANDAGES** These are strips of linen or gauze which may vary in width and length. To bind wounds properly with roller bandages needs more practice and skill than is necessary in using triangular bandages, but they are much better fitting. They are known as circular, spiral, and reverse roller bandages, according to the way they are wound on the parts to be covered.

In a circular bandage each turn covers about two thirds of the previous one. In spiral bandages each turn ascends a little higher than the previous turn at a slight angle to the parts being covered.

The spiral reverse bandage is valuable over the curving contour of a muscle. To

injured part, and usually hold it still, at the same time, it must not be in the way more than necessary, and, above all, it must not slip. This is easily accomplished in cases of injured arms and legs. But for many parts of the body, such as the jaw and the collar-bone, this combination is difficult to attain unless one knows the exact method of fastening the bandage in place.

**HOW TO BANDAGE AN INJURED JAW** In order to bandage the jaw, it is customary to take a long strip of roller bandage, unroll it, and cut a short slit in the middle of its length. This portion of the bandage is held with the slit over the chin—by a helper, if possible—and one side of the bandage is carried back to a position near the ear, looped over, and carried under the chin. It is then brought clear over the head, through the loop and round to the rear of the neck, where it may be tied to the other end coming from the jaw.

The illustration above shows another way of bandaging a fractured jaw, by using two bandages and tying the ends together behind.

**ARM BANDAGES** In almost all serious injuries to the arm a sling of some sort is advisable and indeed necessary. If the injury is in the upper arm, any supporting sling will do, so long as it is not too narrow. If the injury is on the lower arm, however, the sling should be wide enough to support the hand, wrist, arm and elbow, and should be pinned together, or have end patches attached to keep it from slipping.

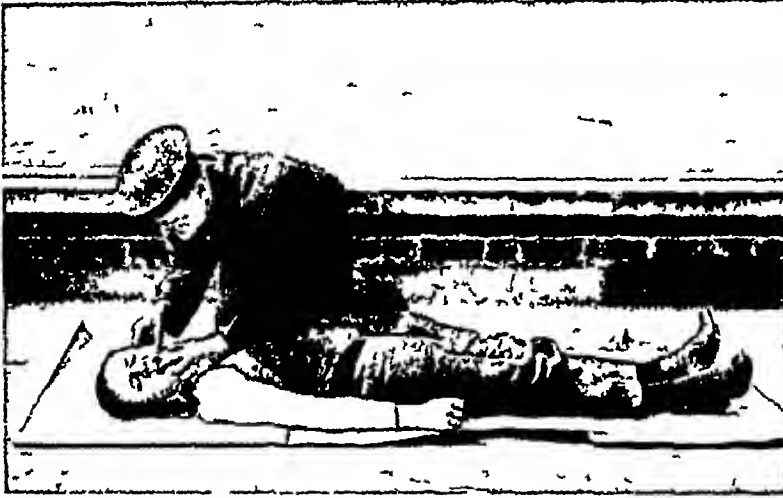


### FRACTURED COLLAR BONE BANDAGES

Two handkerchiefs are folded and laid over the shoulders. Each is tied behind the bladebone and then they are knotted together across the back. A third handkerchief makes a sling.

## FIRST AID

**BROKEN COLLAR-BONE** When a collar-bone is broken, the whole arm affected must be firmly fixed in such a position that the parts of the broken bone will rest naturally. A good-sized roll of cloth is placed under the armpit, the upper arm is held close to the side, and the forearm folded diagonally upward across the chest. One bandage may then be passed along



the forearm, diagonally upward across the back, and tied over the shoulder nearest the hand. A horizontal bandage is then applied to confine the elbow to the side. You should pin or bind the two bandages together at the elbow.

If both collar-bones are broken, the forearms are folded across the abdomen. A few turns of a long bandage are taken round one arm above the elbow, and one end is carried tightly across the back and circled about the other arm. Each free end is then brought to the front round the elbow and tied together.

**BROKEN LEG** Apply a splint on each side of the broken leg reaching from above the knee to below the foot. Tie the feet together to prevent the foot falling outwards or backwards.

**REVIVING THE DROWNED** Of several methods of reviving persons rescued from drowning the Schaefer, or prone, method is perhaps one of the best, as only one operator is needed. First, a drowning person often sucks into his throat sand, weeds, or other refuse, and this must be removed by the finger and the tongue must be held well forward. Clothing about the neck and chest should also be loosened. The patient is then laid face downwards, with arms stretched out beyond his head, and the face turned to one

side, so that nose and mouth are free. It is important to remember that never, even for a moment, must the patient be raised to a sitting posture, as water will then rush to the bottom of his lungs and the recovery will be harder to accomplish. The operator kneels beside the prone figure, placing his hands in the spaces between the short lower ribs, the thumbs being parallel and close to each other. By pressing with the entire weight of the upper body, air is forced out of the lungs, then by relaxing the pressure the chest cavity is enlarged, and air rushes in.

By pressing and relaxing alternately 12 to 15 times a minute, artificial breathing is accomplished. If the pressure does not bring the water out at once, see that the mouth is clear, taking care to wedge the teeth apart. Sometimes it is necessary to work for an hour before the slightest flicker



### HOW TO RESTORE THE 'DROWNED'

The first thing to do is to lay the patient on his back (top picture) and open his mouth to ascertain if the throat is clear, at the same time loosening the collar. The patient is then placed on his front, the face to one side and the arms extended. The operator kneels beside him, and places his hands on the lower part of the body (lower picture). By straightening his arms he compresses the lungs, and by drawing back to the former position causes them to expand and draw in fresh air.

of an eyelid or a gasp rewards the life saver's work, and even then the natural breathing must be aided with artificial breathing for a long time. Do not attempt to give the patient any stimulant until you are sure he can swallow, for the fluid will run down into the lungs.

When there is only one person with the victim, all his time must be taken up in producing artificial respiration. If another person is present it is sometimes useful if both can exert their whole weight in overcoming the stiffness of the abdominal muscles. Then the second

## FIRST AID

person should telephone the nearest ambulance station to send the apparatus called a pulmotor, for forcing oxygen and air into the lungs

The after treatment of nearly-drowned persons is important, and consists in putting the patient to bed and keeping him warm and quiet, as there is danger of pneumonia supervening. Restoratives such as sal volatile and ammonia

can be used with benefit after respiration has completely returned

The Schaefer method is quite the simplest of all methods of artificial respiration, one of its greatest advantages over others being that it requires little muscular effort on the part of the person using it, so little, in fact, that a child, having the knowledge, could conduct it

## An Alphabet of Emergency Hints

**T**HE following directions apply to first aid treatment for mishaps of common occurrence

**Bites of Dogs, Cats, Snakes** If on arm or leg, tie cloth tightly round between wound and body. Squeeze wound to make it bleed so as to get poison out. Apply iodine or rub in crystals of potassium permanganate in case of snake bite. If hydrophobia is suspected, lose no time in getting patient to the doctor

**Blisters** Never open, apply hot water

**Broken bones or fractures** There are two kinds of fractures, simple and compound. When the bone pierces the skin it is called a compound fracture, when it does not, it is a simple fracture. Send for a doctor at once, as unskilled handling may cause a great deal of harm. If a compound fracture, apply solution of iodine, and bandage a sterile gauze compress lightly over the wound

If it is not possible to get the doctor at once, and it is necessary to move the patient, use extreme care and gentleness. Tie the limb to padded splints that extend past the joints at either end of the broken bone, tying the bandages outside the splint.

**Bruises** Apply very cold water at first, or witch hazel or arnica or vinegar diluted with water, afterwards use hot applications. If the skin is scratched wash with warm water and pure soap and apply iodine

**Burns and scalds** A burn is caused by dry heat, a scald by moist heat, usually steam or boiling water. To relieve the pain, some dressing to exclude the air is needed. If possible a special preparation of tannic acid should be applied. Failing this, cold tea or carbor oil, a mixture of linseed-oil and lime-water in equal parts, is soothing. If clothing adheres to a burn, never tear it away, but cut it carefully as close to the wound as possible. In case of very severe burns, send for a doctor at once.

**Chills** Put well covered hot-water bottles under arms on thighs, and at feet. Rub limbs towards body, to restore circulation. Chills may be the first indication of serious illness, so a doctor should be sent for immediately

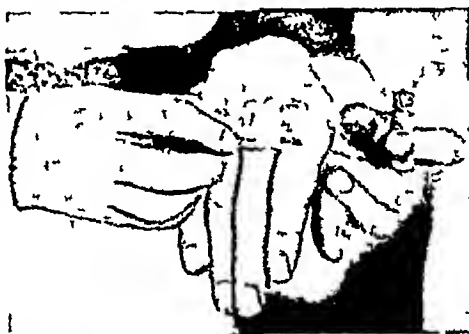
**Choking** Slap the patient on back. If the choking persists, cause vomiting by passing finger down throat, or by giving a small dose of ipecacuanha wine, or salt or mustard and water. If the patient is a child, hold it up by the feet, head downward, and slap on the back between the shoulders

**Convulsions** Put patient in warm bath with cold cloths at head. Send at once for a doctor

**Croup** This is usually more alarming than dangerous. Give the patient one teaspoonful of ipecacuanha wine to cause vomiting. Keep in warm room with

plenty of moisture in atmosphere until entirely recovered. If croup is not cleared up in 24 hours, call a doctor

**Cuts** The first thing to be done is to stop the bleeding. In simple cuts this may be done by the application of clean cold water or by moderate pressure on the wound. When a large vein or artery has been severed any delay is dangerous. Lay the patient down with the head raised only slightly, but with the wounded portion raised as high as possible. Lay a pad or compress over the cut, first bringing the edges of the wound together and fasten with a bandage and wet with clean cold water



Any small, clean cut will soon heal if you apply a film of collodion with a camel's-hair brush

If the wound is in the leg or arm, and the compress fails to stanch the blood, pressure must be applied to the main artery or vein. This is done with a tourniquet. In the leg the artery is in front and a little below the groin. In the arm it is on the inner side, under the biceps muscle. Place over the artery a small piece of wood, a little stone or

a hard knot tied in a handkerchief, and over this and round the limb tie a bandage made of anything at hand. Run a stick between the cloth and the flesh and turn it until the pressure on the artery is sufficient to cut off the circulation. Cutting off the circulation for very long at a time is dangerous, and the bandage should be loosened as soon as possible, in no event should it be left on for more than an hour. Be ready to tighten it again, however, if bleeding begins anew. If a vein has been severed, the tourniquet must be applied between the wound and the end of the limb. Pressure directly over the wound is the only way to check the bleeding, when the cut is in the body. For slight cuts touch with tincture of iodine

**Fainting** Place the patient in a horizontal position and dash cold water in face. Let patient inhale smelling salts. Remember that an unconscious person cannot swallow

**Fits** These may be apoplectic or epileptic, the latter are distinguished by spasmodic movements of the limbs. Place cork or pencil between patient's teeth to prevent tongue biting and don't use force to control muscular spasms

**Foreign body in the ear** If it is an insect, drown out with warm olive oil. A light held near the ear often attracts the insect, which can then be extracted. For anything other than an insect see a doctor

**Foreign body in eye** Wink, never rub. Pull upper lid over lower, blow opposite nostril. Wrap the end of a toothpick with absorbent cotton, dip in solution of boracic acid and wipe gently across the eyeball. If the foreign body can be seen touch with the



When removing a mote from the eye hold the eyelash firmly, and press a match against the lid as you turn it outside in.

## SOME STRANGE INHABITANTS OF THE SEA



KEY TO COLOUR PLATE OVERLEAF

THE ocean waves, so monotonous in their restless, eternal dance, hide beauties more vivid and shapes more strange than any dry land vista can show. There are gardens coloured like sun sets, lawns and parks of brilliant hues, and forests of tangled green and brown. There are mountain peaks and dark caves and valleys so deep that not a ray of sunlight ever reaches them.

On the following page is a scene such as you might observe if you were lying very quiet on a bank of sea moss off one of the West Indies islands, peering through the glass window of a diver's helmet.

You see a flat Angel Fish (1) looking on like a submarine moon while a school of Blennies (3) swims into view. Between them a pair of Sea Horses (2), gripping the kelp with their tails, are hoping their hungry foes will mistake them for bits of seaweed.

That red Sea Fan (4) seems to be a plant, but it is really a colony of tiny coral animals. Below it, the hideous Gurnard (5) is searching with its six feelers for food on the ocean floor. Those star-shaped "flowers" at the right (6) are animals too—Sea Anemones. Let some passing creature brush against those "petals" and they will close up like a flash, and if the passing creature happens to be small enough it will be caught inside and eaten. At the left you observe a Sea Urchin (7), protected, as it crawls mouth down along the bottom, by its sharp spines. In the corner, to complete the picture, lies a Mushroom Coral (8), stone hard and beautifully fashioned.



## SOME STRANGE INHABITANTS OF THE SEA



*Painting by Milo Winter*

The fish world holds marvels of life and colour more astonishing perhaps than any to be found on land. Here the artist shows you a corner of this strange world of quaintly shaped creatures in their bright-coloured surroundings. We can read more about it overleaf, where there is given a key explaining the names of the fish.



## FIRST AID

swab lightly and usually it will come away with the swab. A drop of castor-oil in the eye will soothe subsequent irritation.

Be careful not to press upon it, however, for this may drive it into the eyeball. In the case of any metal substance keep the eye shaded and see a doctor at once.

**Heat exhaustion or sunstroke.** Reduce high temperature of body either by wrapping the patient in a sheet which is kept saturated in cold water, or by applying ice water cloths to the head, back of neck, and hands. Send for the doctor.

**Nose-bleeding.** Keep head upright, raise arm on bleeding side, apply cold cloths to back of neck and across bridge of nose. If bleeding continues, plug the nostril with cotton saturated in dilute hydrogen peroxide.

**Poisoning.** An emetic is given in all cases of poisoning except when lye or other caustic alkalis have been swallowed. Then an acid (vinegar and water, lemon or orange juice or other dilute acid) is first given to neutralize the effect of the alkali, and this is followed with whites of eggs in milk, and olive oil. In poisoning by all acids except carbolic give alkalis—baking soda (1 teaspoonful in a cup of water), lime-water, magnesia, even a tablespoonful of strong soap-suds if nothing else is at hand. Follow with the beaten white of an egg and milk, olive oil and coffee. For carbolic

## FISH

acid poisoning give a tablespoon of Epsom salts in a glass of water, or beaten whites of eggs in milk. For laudanum, morphine, heroin, or other form of opium poisoning, give an emetic followed by strong black coffee, and (most important of all) keep patient awake by walking, slapping or any other means. If the patient falls asleep it is liable to prove fatal.

**Stomach poisoning.** Vomiting is necessary, so give warm mustard water or ipecacuanha wine, give castor oil.

**Sore throat.** Gargle with salt water. If accompanying cold and catarrh, inhale medicated or other steam, apply a bran or linseed poultice and remain in warm room with regulated temperature. If the attack is severe, or does not yield to treatment, or if the temperature rises above 100° F, see doctor.

**Stings of insects.** When the sting remains in the wound extract with tweezers, if possible, a key barrel pressed over the wound will often withdraw the sting. If both fail, apply hot poultice, this will also reduce inflammation and relieve pain. Iodine, salt water, weak solution of ammonia, and vinegar and water will also reduce inflammation.

A piece of common soda moistened and rubbed gently over the part is useful.

**Toothache.** Relieve pain by cleaning cavity and inserting piece of wool saturated with oil of cloves.

## DENIZENS of the WORLD of WATER

*How do fishes breathe, and can they hear? What fishes build nests, and why? Why are so many fishes silvery in colour? If you want to know the answers to these questions—and many more—read on*

**Fish.** As a whole, the fishes form a fairly compact class of the animal kingdom, developed especially for life in the water, cold-



blooded, gill-breathing, and with the limbs developed as fins. One major group comprises the cartilaginous (gristly) fishes—fishes with a partly cartilaginous skeleton—and with the gills fastened by the longer side, like leaves in a book, sometimes as many as five on a side. This group includes sharks, rays and skates.

The outstanding features of this group are the skeleton, consisting of gristle without bone, and the peculiar skin. They have no true overlapping scales, the skin is tough and mottled, and is naked, or covered either with wart-like projections, tipped with a hard bony pimple or with bony scales resembling teeth.

The other great group, the bony or modern fishes, includes most of the food and game fishes in fresh and salt water—the cod, bass, perch, trout, pike, mackerel, etc. Minor groups contain the armoured fishes or “ganoids,” covered with enamel like scales and sometimes further protected with spines and prickles, and the mud-fishes or lung-fishes, possessing

both gills and lungs, which enable them to live in the air under certain conditions. They have very peculiar fins, usually very primitive in structure.

The body of a fish is streamlined to perfection, allowing the fish to move through the water with as little resistance as possible. There is no neck, and the greatest width of the fish's body is in front of the middle. A flattened tail is used to propel the fish through the water, the fins directing the course.

Most fish depend on speed to secure their food or to escape from their enemies, so their bodies are shaped for speed, but there are some fish that hide on the bottom of the sea, or in crevices, and others, as mentioned above, that are protected by bony plates. Some of these fish are almost globular in shape. The body is generally covered with overlapping scales, growing attached to the skin. Some are covered with smooth skin, as the cat fishes, and the ganoids as stated above, are armoured.

### Facts About Fish Anatomy

Movement of tail and fins is controlled by muscles. The backbone is loosely jointed, so that the fish may turn, twist and dart at ease. Most fishes possess an air bladder, but its purpose is not clear, it has been regarded as a balance, weighting or lightening the body as required. In the lung fishes the air-bladder is divided to form the lungs.

A heart pumps the red blood through the body, just as it does in the higher animals. The

## FISH

blood is purified in the gills by the oxygen in the water. Sometimes, when the water is foul, the fishes come to the top and try to gulp in the air, but their gills are not fitted to use the oxygen in the air. Fishes breathe the water by taking it in at the mouth, letting it flow over the gills and out through the opening behind the gill covers.

Along the sides of fishes there is a line called the lateral line, which is made up of peculiar scales, beneath which there are a very great number of nerves. This is, in all probability, a sense organ, helping the fish to perceive disturbances in the water.

### Facial Features of the Fish

A fish has a face something like that of the higher animals. There are eyes, a nose, and a mouth. The eyes of fishes vary greatly in size and form. There are no eyelids and the fish can see but a little distance, although it sees over a very wide angle on either side above and below. In caves the fishes are blind, once they had eyes, but through long disuse the eyes have lost their sight. Deep sea fishes have very small eyes. The power of smell is situated in the nostril, but it is very feeble. This nostril is a closed sac and has nothing to do with breathing. There is hardly any sense of taste. The tongue is hard and gristly and fixed, and the fish eats very fast, chewing merely to cut or crush the food, and often swallowing it whole.

Fish hear, in our sense of the word, scarcely at all and the hearing apparatus is buried in the skull and has nothing to do with the ear-like flaps. They are, however, very sensitive to disturbances in the water, as the sense of touch is very highly developed. If they come in contact with a suspicious object, fish dart quickly away. Some fish have sensitive feelers or "barbels" by which they explore the bottom or feel their way to food, and these barbels are highly specialized. They are attached sometimes to the nostrils, sometimes to the jaw-bone, sometimes to the skin of the chin or snout, and sometimes over the eyes. The goat-fishes of the tropics are named from the two long barbels that hang from their chin.

The nervous system of the fish is not highly developed, and it feels very little pain. It often happens that a fish which has torn itself loose from the hook will be caught again soon after.

The mouths of the various genera and species differ widely. Sometimes the mouth is a great horizontal gash almost from gill to gill, sometimes it is round and tiny, and sometimes it is developed into a long beak. The jaws also differ widely. Sometimes the bones are joined with ligaments that may be stretched, especially among deep sea fishes, so that the fish may swallow other fish larger than itself. Sometimes the jaws are tube-like, and it is a wonder that

the fish can swallow anything. In the sharks and rays and skates the mouth is on the under-side of the body.

The mouth may have no teeth, or the teeth may be on the jaw-bone only, or on any bone in the mouth's circumference. Just inside the mouth are gill rakers, which strain the water, and at the opening of the gullet behind the gills are bones with additional short thick teeth.

The ground colour of most fish is usually protective, with mottled or barred colourings, usually grey or a sort of olive on the back, with the belly white.

To birds looking down on the water the back with its mottled stripes is the colour of the water with the shadows on it, to fishes below in search of prey the under part is the colour of the surface of the water, with the atmosphere above it. In the tropics, where red seaweeds and other aquatic growths of brilliant colourings abound, the fish are bright-coloured. In the greater depths of the ocean the fish are deep black or violet-black, sometimes with silvery phosphorescent lights.

Little interest is displayed by most fishes in their young. After the eggs, a jelly-like mass, are deposited, they are left to hatch or be destroyed as chance wills. There are exceptions to this practice. The stickleback builds carefully a nest of sticks cemented with a kind of gum from its body, and after the eggs are deposited stands guard until the fish are hatched. Bass and sunfish also guard their eggs, and so does the uncouth lump sucker. Some species of fish, among them the salmon, leave the sea and ascend to the headwaters of rivers to deposit their eggs.

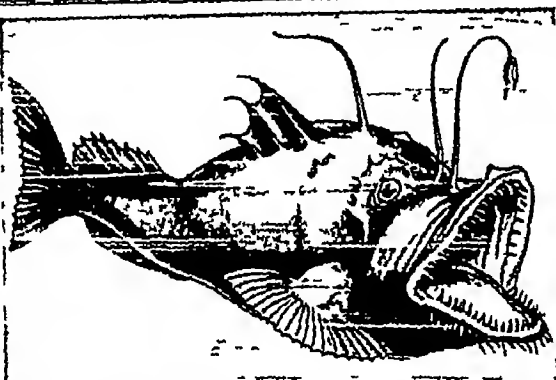
### Why Fish Lay Millions of Eggs

Some fish hatch their young in an egg sac, some of these baby fish are tiny at birth, others quite large. Some sharks and a few other fishes are born alive and well developed, and most young fish take care of themselves from the first. The destruction of eggs and young is very great, for almost every species is a prey of larger fish, so the vast numbers of eggs that are deposited by some fishes are necessary to preserve the existence of the species. A large cod produces about 10,000,000 eggs every year.

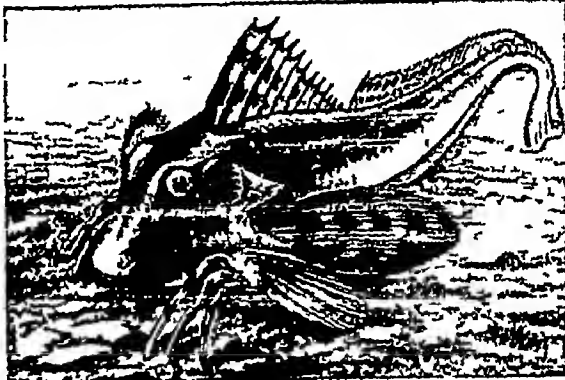
In general the young fish differs from the adult only in size and proportions. The eyes and head are comparatively larger, the fins are lower, and the body comparatively more slender. Most fish live on indefinitely, until they fall victims to larger species. The exceptions to this rule are those fishes, such as the salmon, which have a definite period of growth before spawning, and after spawning probably die.

Some fish are killed more readily than others. Fish usually die very quickly in the air or in

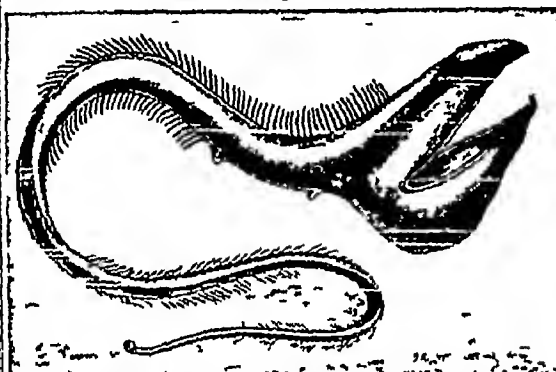
## A FEW OF DAME NATURE'S FISHY FREAKS



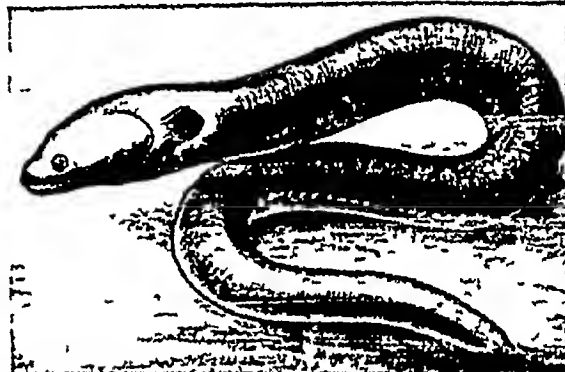
The Frog Fish or Angler Fish, lies on the ocean bottom with his mouth open. His waving feelers attract small fish, and when one comes close enough, the great jaws fly shut and the Angler dines.



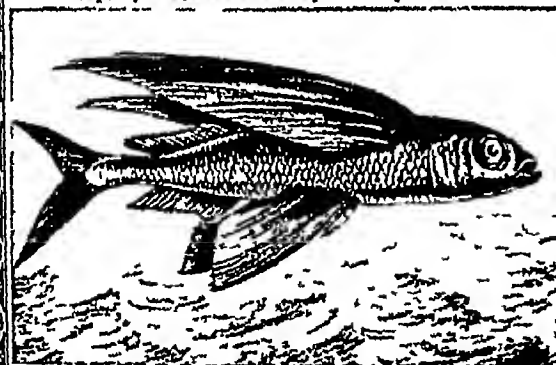
The curious Streaked Gurnard has a huge armoured head and he walks on the sea bottom with the bony rays of his unusually large side-fins, some of which are like fingers.



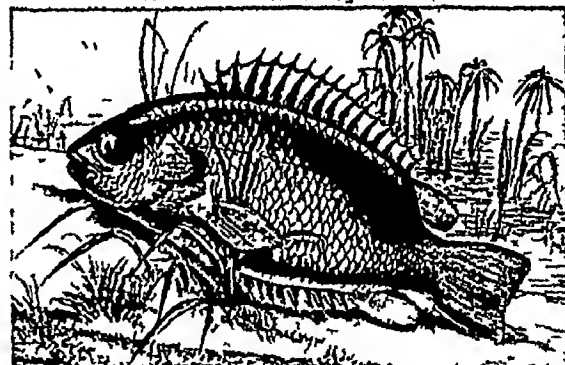
This deep-sea monster, who seems all mouth, belongs to the "Pelican Fish" family and lives in the black and icy depths, where the sun's rays never penetrate.



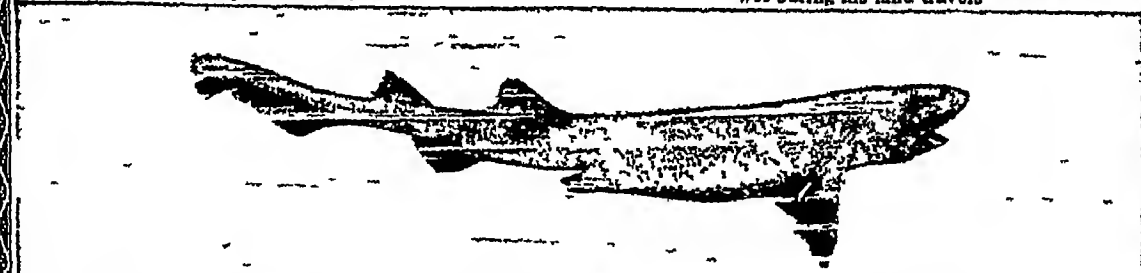
The Electric Eel is Nature's greatest storage battery. His "charge" is strong enough to shock a horse, and comes from electric cells along his sides.



The Flying Fish is one of Nature's puzzles. Scientists cannot agree whether he really flies by flapping his fins, or merely soars through the air. Whichever may be the truth, some varieties of flying fish can cover 200 yards or more in the air, and even alight on the decks of ships in efforts to escape their enemies.



The Climbing Perch of India saunters about on land in search of new water when his old home threatens to dry up, and sometimes even climbs trees. He does this usually during the night or early morning when dew is on the ground. He has a special arrangement for keeping his gills wet during his land travels.



The Spotted Dog-Fish is a small shark, and he hunts in packs with his comrades through shallow waters near shore. His long body with his powerful fins makes him a highly efficient hunter, and fishermen dislike him because he scares away the food fishes.

**foul water** The lung-fishes, however, live in a ball of half-dried mud during the dry season, and some of the Asiatic mud fishes can maintain themselves for a long time out of water. Carp frozen in the ice are said to revive in the spring.

Some fish eat both vegetable and animal matter, others eat only vegetable matter, and still others confine their diet to other fish. In flesh-eating fish the mouth is usually large and the body slender, built for speed. Many fishes live on minute organisms strained from the water, the "plankton" of the oceans.

Altogether there are about 13,000 species of fish, all interesting, and many with remarkable characteristics and weird shapes and colourings. The tunny, a giant mackerel, grows nearly 20 feet long and weighs 1,000 lb or more. Some sharks reach a length of 40 feet and weigh many hundredweight.

Fish usually have no voices, but there are fishes which do make a distinct noise. Sometimes this is a grating sound caused probably by the rubbing together of the short thick teeth of the gullet, and sometimes it is in the nature of a quivering or singing sound, probably arising in the air-bladder.

Some fishes have curious weapons of offence and defence. There are the electric fishes, with power to inflict electric shocks on their prey or their enemies. The electric eel, which is the most powerful of these forms, inhabits the rivers of Brazil and other countries of South America, its shock is powerful enough to stun a man. Some fishes are provided with a poisonous slime or mucus which flows over the spines, so that a wound made by them is very painful. The spines of the common cat fish have this property to some extent. In some fishes the form of this spine is modified so as to form a poisoning instrument, and the poison is pressed through the tube as the spine is thrust in. The greater weaver of the African coast has poisonous spines on its gill covers.

#### Strange Fish of the Tropics

The frog-fish of the tropical seas have two fins resembling legs, with which they creep along the rocks like toads. The head is the largest part of the body, and the mouth is the largest part of the head. The jaw muscles are strong and the teeth sharp. This fish belongs to the anglers—fishes with barbels hanging down in front of their mouths, the use of these barbels being, presumably, to attract other fish within reach. Some of these barbels are bright-coloured while others glow with a phosphorescent light.

In the sword-fish and saw-fish the snout is prolonged into a flat blade, used for slashing up the food such as giant squids on which these creatures generally feed.

Then there are such curiosities as the climbing perch. When there has been a heavy rainfall

and the water runs down the trees at the edge of a pool, these perch crawl up the tree sideways, sometimes to a height of five to seven feet. If the fish is thrown on the ground it runs rapidly along in the same sideways manner, as long as the mucus remains on its skin. The flying fish are capable of lifting themselves from the water and soaring through the air, sometimes for several hundred feet, the large pectoral fins spreading as a parachute to sustain the body.

The fishes of the tropics are often brilliantly coloured. The parrot fishes of the Mediterranean coast and the Indian Ocean have vivid colourings of red, green and purple, and the butterfly-fishes are striking examples of black and yellow coloration. The goldfish of China and Japan are found only in domesticated specimens, the brilliant colouring being retained by artificial selection. The originals of the gold fish are olive-coloured.

The value of fish to Man is not confined to its use as a food. Many fish are sought for the oils, generally liver oils, which they yield, while the skin of some others is valuable. From dried and powdered fish offal valuable animal foods and fertilizers are manufactured.

#### Fish's Place in Evolution

Fish are particularly interesting from the evolutionary point of view because they are regarded as the first vertebrate (backboned) creatures. At a very remote period certain animals began to develop a spinal cord. At first this was little more than a bundle of nerve fibres down their backs. But in the course of time this cord in some of the water dwellers became covered with a jointed rubber-like sheath of cartilage which served as a protection, and rib like arches grew out from this sheath. At the same time the skins of these creatures developed horny dots. These were the ancestors of the fish. Sharks and rays are survivors of this primitive type.

In another group the bony dots developed into armour-like plates, and this "ganoid" type also survives in fishes like the sturgeon. These two families ruled the sea as late as the Coal Age.

Meanwhile another branch developed air breathing apparatus, and crawled out occasionally upon land, as in the case of the present-day climbing perch. From such creatures developed amphibians, reptiles, and birds. (See Birds, Evolution, Reptiles)

Under water the course of evolution developed the cartilage skeleton into bone, and changed the bone like dots into silvery scales, thus creating the highest type of fish, such as the trout. The development continued until the period which geologists call the Pliocene, since which time the fish family has undergone practically no change. (See also Fossils, Geology, and articles on the principal fish)

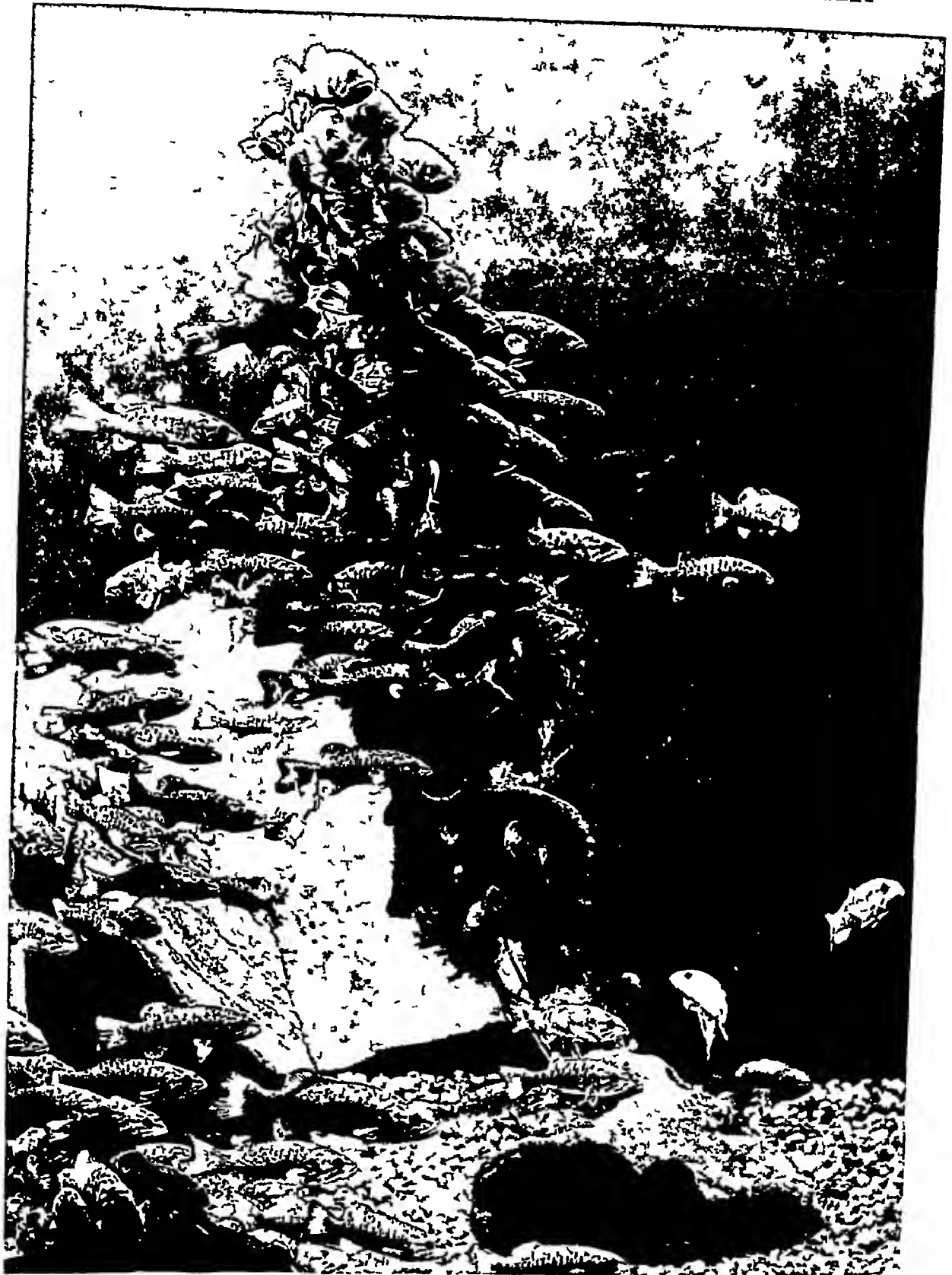
# CAMERA 'CATCH' OF FISH & FISHERS



It is both difficult and dangerous to try to photograph a shark under water. But the American who took this picture J. E. Williamson, originator of undersea photography, was let down from a boat inside a special compartment so that he and his camera were safe. Some kinds of shark ("littoral") remain close to the shore but the one you see here is of the "pelagic" kind and he is cruising deep below the surface of the Atlantic.



## AMERICAN FISH THAT 'FLOCK TOGETHER'



Elwin R. Sautorn

These handsomely marked fish are American bass. They live in fresh water and their tender flesh is very good to eat. But the New York Aquarium, where they were photographed, is seemingly not warm enough for them and so they cling together, heads all pointing in the same direction in this extraordinary floating cluster. Bass of quite a different species also frequent the southern shores of England and Ireland; they are very popular among sea anglers as sporting fish and are considered by the expert to have an attractive and delicate flavour.



## BEAUTY AND UGLINESS IN THE WORLD OF FISH



The pretty little fish you see in the top photograph are angel fish one of the most popular sorts to have in the aquarium. Those long bony projections are used to protect their delicate fins from harm when they swim among the rocks. These fish must not be confused with another angel fish a relative of the sharks. Below you see a repulsively ugly creature a male lump-sucker, so called from the flat sucking disk on its underside by means of which it clings to the rocks when attacked. It is here guarding a pile of eggs seen in front of its mouth.

*W. S. Berridge Schensky*

## TRAWLING FOR FOOD-FISH IN THE NORTH SEA



The men who catch the fish you eat lead the hardest life of all mariners. For days and weeks at a time North Sea trawlers remain cut off from the land. The "trawl" is a huge net sometimes 80 feet long which is dragged through the water. The North Sea is shallow, and fish abound especially on the Dogger Bank; they include halibut, soles, turbot, brill, plaice, cod, haddock etc. North Sea fish are famous for their excellent and distinctive flavour for these waters are particularly rich in "plankton" minute organisms on which fish feed.

## THE YARMOUTH FISHING FLEET IN PORT



FOA

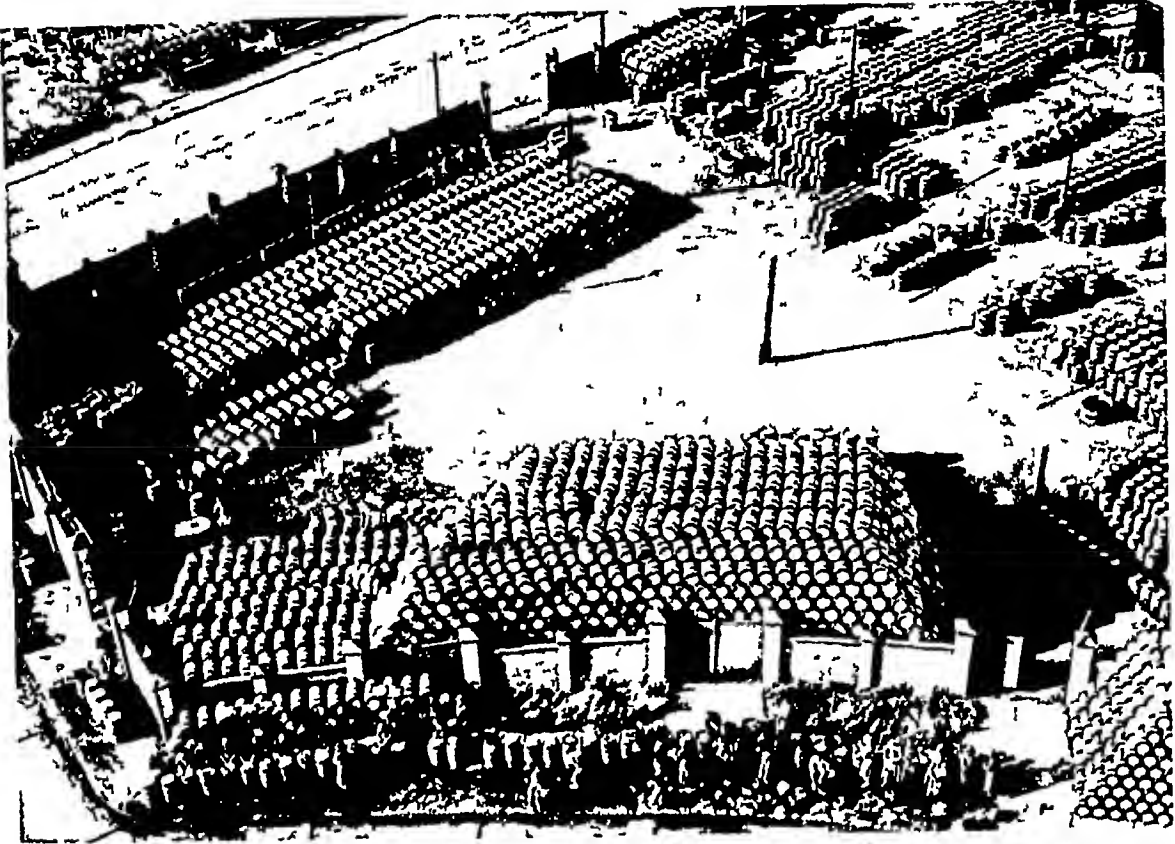
Yarmouth probably reminds you of bloaters. But the several hundred tons of fish you see unloaded here consist of bigger game for Yarmouth has a large share in the North Sea cod fisheries as well. The Yarmouth fleet employs 3,000 people and uses about 500 boats—little ones of some 40 tons each. You can count 14 of them in this photograph. They are called "drifters" because of the fine-meshed drift net which is suspended in the water between two boats and in which the fish catch their gills and so suffocate.

## FISHERY WORKERS WHO DO NOT GO TO SEA



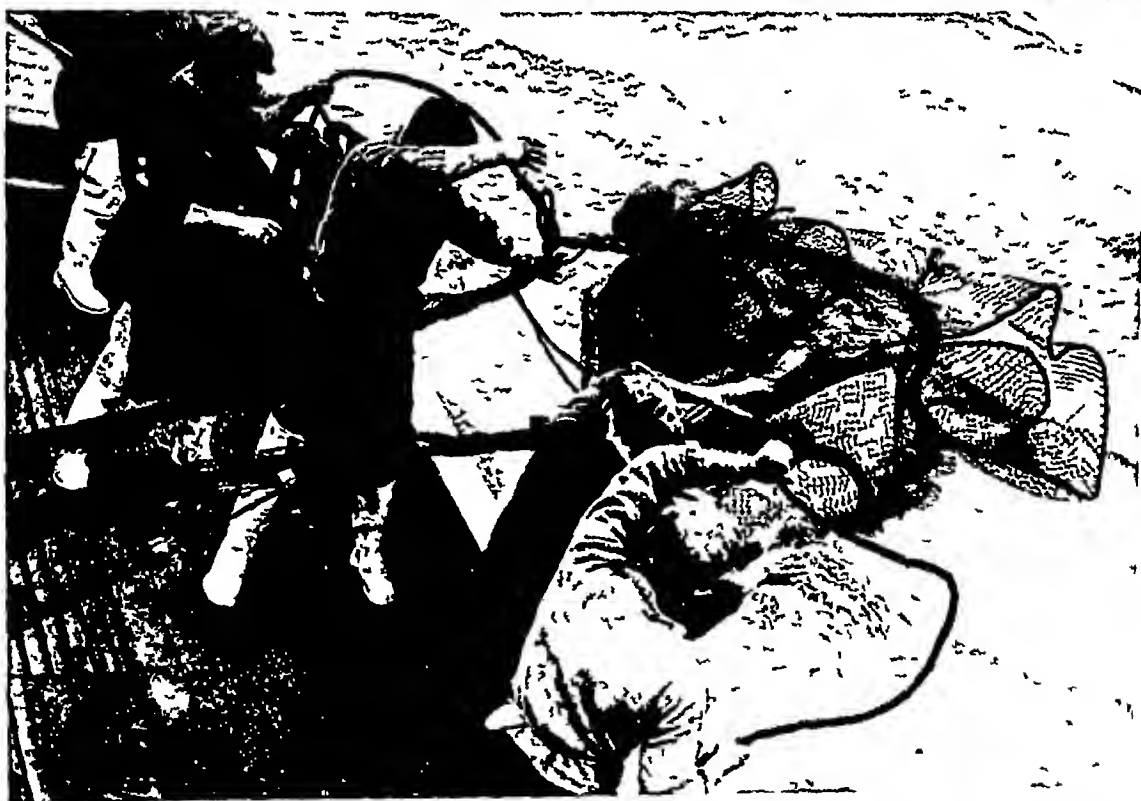
Every autumn Yarmouth imports thousands of fisher-girls from Scotland to deal with the enormous catch in the East Anglian herring season. Here you see some of those hard worked girls 'gutting' the fish which will soon be salted, smoked and distributed to thousands of English breakfast tables as kippers or bloaters. Yarmouth also borrows some 400 Scottish drifters for this great season in addition to the usual fleet. Herrings, like sprats and pilchards which belong to the same family are an extremely nutritious food.

## 'SLUMP' AND 'BOOM' IN THE FISHING INDUSTRY



There are so many fish in the sea that the fishing industry unless carefully controlled cannot always make the supply fit the demand. The top photograph shows thousands of barrels of herrings left over at Yarmouth—in the height of the season too. A recent glut had made herrings too cheap and the drifters were idle. Yet a fine trade is expected at St Andrew's Dock Hull (in the lower photograph) for this photograph was taken just before Easter, and plenty of fish are wanted for the Good Friday fast.

## SETTING THE NETS IN RIVER AND SEA



*For*  
Fishing in fresh water still has something of the gentleman's leisurely pastime in it. Long net salmon fishing (upper photograph) in the River Severn at Epney, Gloucestershire goes on today in exactly the same way as it has done for hundreds of years. How different is this from the commercial fishing in the sea! In three days the total haul on board the Yarmouth drifter *Ocean Sunlight* (from which the nets are being 'shot' in the lower illustration) was over 100 000 herrings. Such nets stretch for two miles.



# The TALE of the TOILERS of the SEA

*An industry which recruits its workers from only the boldest and bravest  
is deep-sea fishing Here you may read of the dangers that confront the  
adventurous fishermen and how they are overcome*

**Fisheries.** The "toilers of the sea" have ever been famous as the bravest and hardest of men, venturing in small craft over the wildest oceans, year in and year out



No more romantic picture can be found than the Breton fishermen keeping watch each season on the rock-bound coasts of northern France, waiting for the peaked sails on the horizon which tell them their men are coming home—counting these sails, knowing that some of them may be missing, peering under

their hands for the marks on the canvases that tell the toll of dead, and then courageously turning away towards the village church to prepare funeral services for those whose bodies lie far away on the Grand Banks of Newfoundland

It is probably true to say that no man leads a harder life than that of the fishing crews of trawlers in the North Sea and the North Atlantic, whose craft figure so often in the lists of lost or "missing" vessels

## How Fish Are Prepared

Since the earliest days of history men have fished for their food in seas, lakes and rivers, and today the catch of the fisherman appears on the dining tables of every country in the world. Fresh fish are boiled, broiled, baked, fried, and even eaten raw, as in Japan, the Pacific Islands and certain parts of Russia. For future use fish are salted, dried, smoked, pickled or preserved in tins, and in these forms find their way to places far distant from the waters in which they are found

Trading in fish is of great antiquity. Ponds in which the ancient Egyptians kept rare foreign fish alive until they were ready for use have been found in Northern Africa. A thriving trade in highly-prized lampreys and eels was carried on between Rome and distant portions of the empire, and fish are said to have been imported into Italy in those days from points as far distant as the Caspian Sea, on the border of Asia. The Mediterranean Sea has always been famous for its fisheries, but in recent times the European centre of the fish industry has moved to the northern countries—Britain, France, Norway and Germany

In the Western Hemisphere are the great fisheries of North America, extending from Massachusetts to Labrador and along the Pacific coast. In less than seven years after Cabot discovered Newfoundland and reported the cod fisheries there, the French sent over their fishing fleets and paid bounties to encourage the industry. Other nations soon followed, and the abundance of food fishes had a great influence on the colonization of North America

## Fisheries of Many Kinds

The term "fisheries" means the taking of all kinds of water products for commercial purposes, and thus it includes the hunting of whales, seals and other mammals, as well as the catching or netting of true fishes. It includes also the taking of lobsters, crabs, shrimps, the catching of frogs, alligators and turtles, and even the gathering of pearls, sponges and coral. The countries where fishing is a principal industry are Great Britain, Japan, China, France, Canada, Russia, Norway, Germany, the Netherlands and the United States. Nearly all countries with a sea coast, however, have fisheries of greater or less value

Cod fishing, as practised on "the Banks," is particularly perilous. Large fleets of motor-driven vessels make their way to the seas off Newfoundland, where the depth is only a few hundred feet. Each ship has a number of small "dories" or flat bottomed row-boats, manned usually by two members of the crew, who put off from the mother ship each morning. Sometimes in a sudden fog the dories cannot find their way back to the trawler, sometimes they are driven far out to sea by storms, and sometimes a big wave swamps a boat overloaded with a big catch

The fishing is done with hand lines, with trawl-lines, and with nets. The trawl-lines consist of great lengths of rope, from which hang numbers of short lines carrying the hooks. These are baited and the whole contrivance is carried to the bottom by anchors. A small buoy with a line running down to the trawl marks the spot

Each dory may set out several such trawls, visiting them at intervals to drag them up, clear them of fish, and rebait the hooks. Usually from 200 to 300 fish are caught on a trawl, and on good days the dory may have to make several trips to the schooner to unload

Sometimes a gill net is used. This is a net hanging down straight like a screen, the bottom being weighted with lead. The cod swim against the net, their gills become entangled, and they

## FISHERIES

cannot escape The cleaning and salting is usually done after the day's fishing, and often when the haul is large the men work the greater part of the night Sometimes a collecting ship takes the haul back to market

Icelandic waters now vie with the Newfoundland banks as the richest cod fishing grounds in the world Here the great fleets of modern ocean-going trawlers from Hull and Grimsby reap a rich harvest of cod, haddock, ling and halibut Costing over £30,000 each, the latest type of British trawler is the most efficient craft of her kind in the world today Equipped with wireless, ice-storage accommodation, liver oil extractors, and powerfully engined, she can remain six weeks at sea before returning to port with her "cargo" of 300 tons of fresh fish

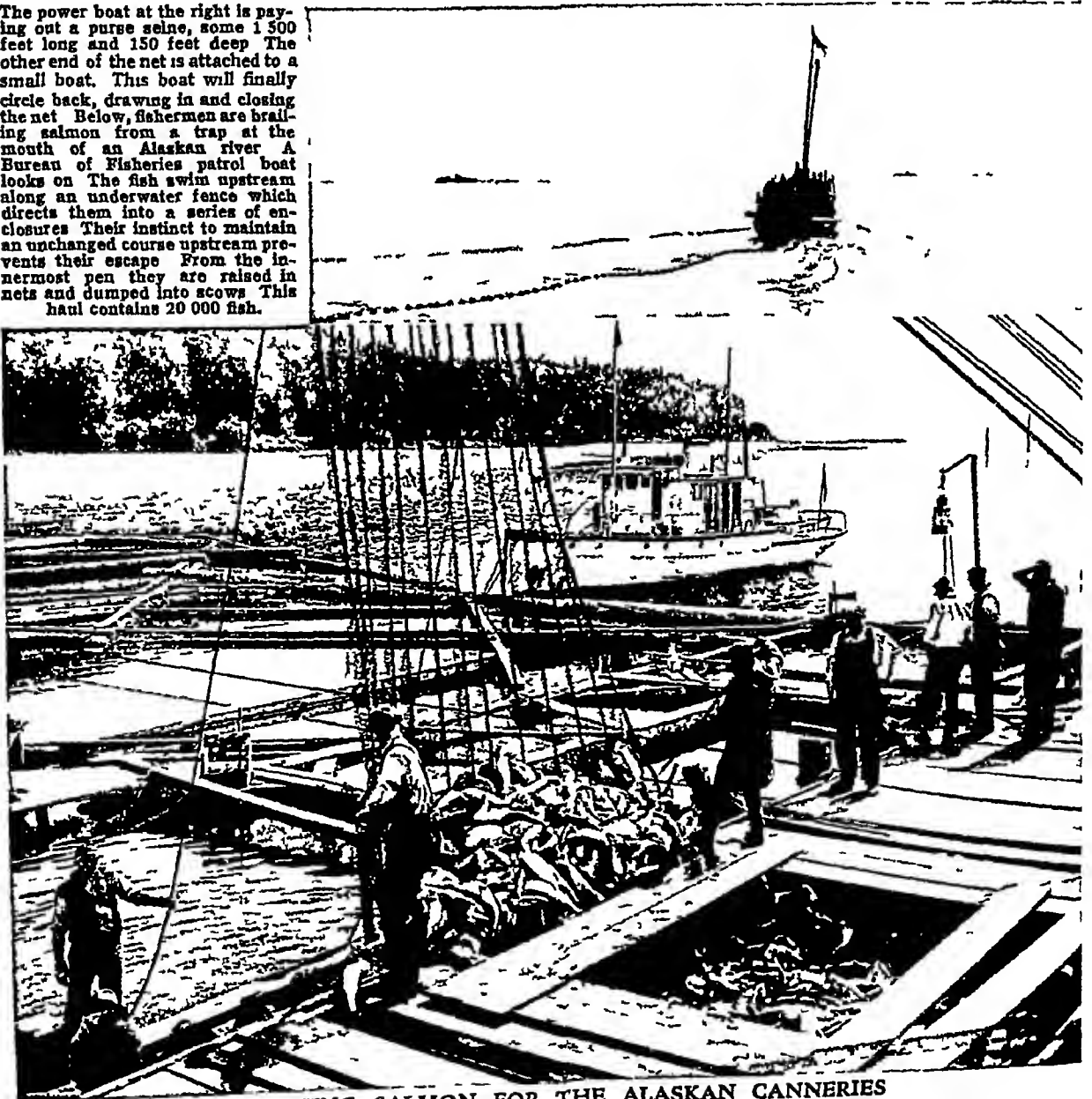
The far seeing and courageous policy of the Federation of British Trawler Owners has

resulted in the development of very extensive fisheries in the White Sea and the waters round Bear Island, far within the Arctic Circle

The most important fish commercially, exceeding even the cod in world trade, is the herring The leading herring fisheries today are in Norway, Sweden, France and Great Britain, and the industry is growing rapidly in Canada Herring constitute anything up to 25 per cent of the yield of all European fisheries These fish travel in great "shoals" closely packed together over areas many miles wide They are caught in drift nets and in huge traps called "weirs"

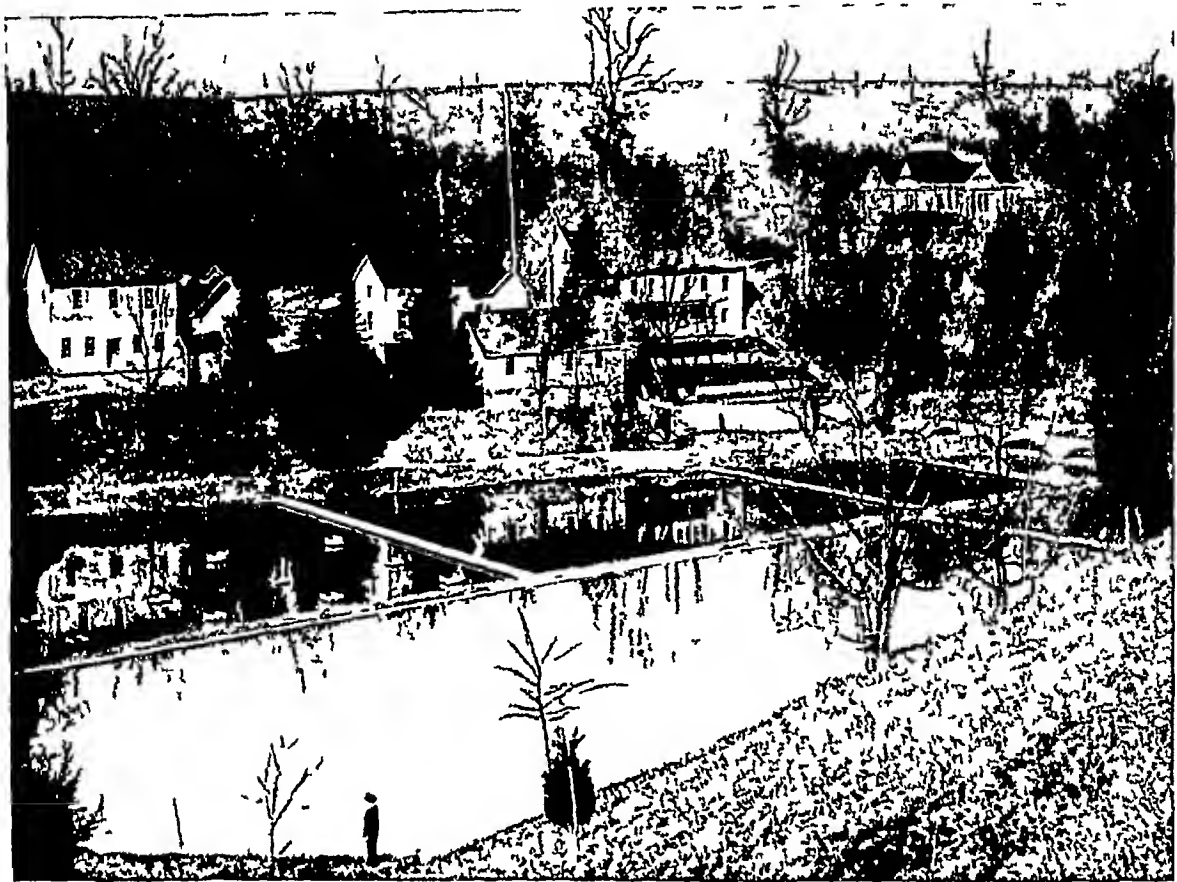
The herring industry is deemed so important in the national economy of Britain that all its operations are directed by a National Herring Board responsible to the industry and the Ministry of Agriculture and Fisheries

The power boat at the right is paying out a purse seine, some 1 500 feet long and 150 feet deep The other end of the net is attached to a small boat. This boat will finally circle back, drawing in and closing the net Below, fishermen are brailing salmon from a trap at the mouth of an Alaskan river A Bureau of Fisheries patrol boat looks on The fish swim upstream along an underwater fence which directs them into a series of enclosures Their instinct to maintain an unchanged course upstream prevents their escape From the innermost pen they are raised in nets and dumped into scows This haul contains 20 000 fish.

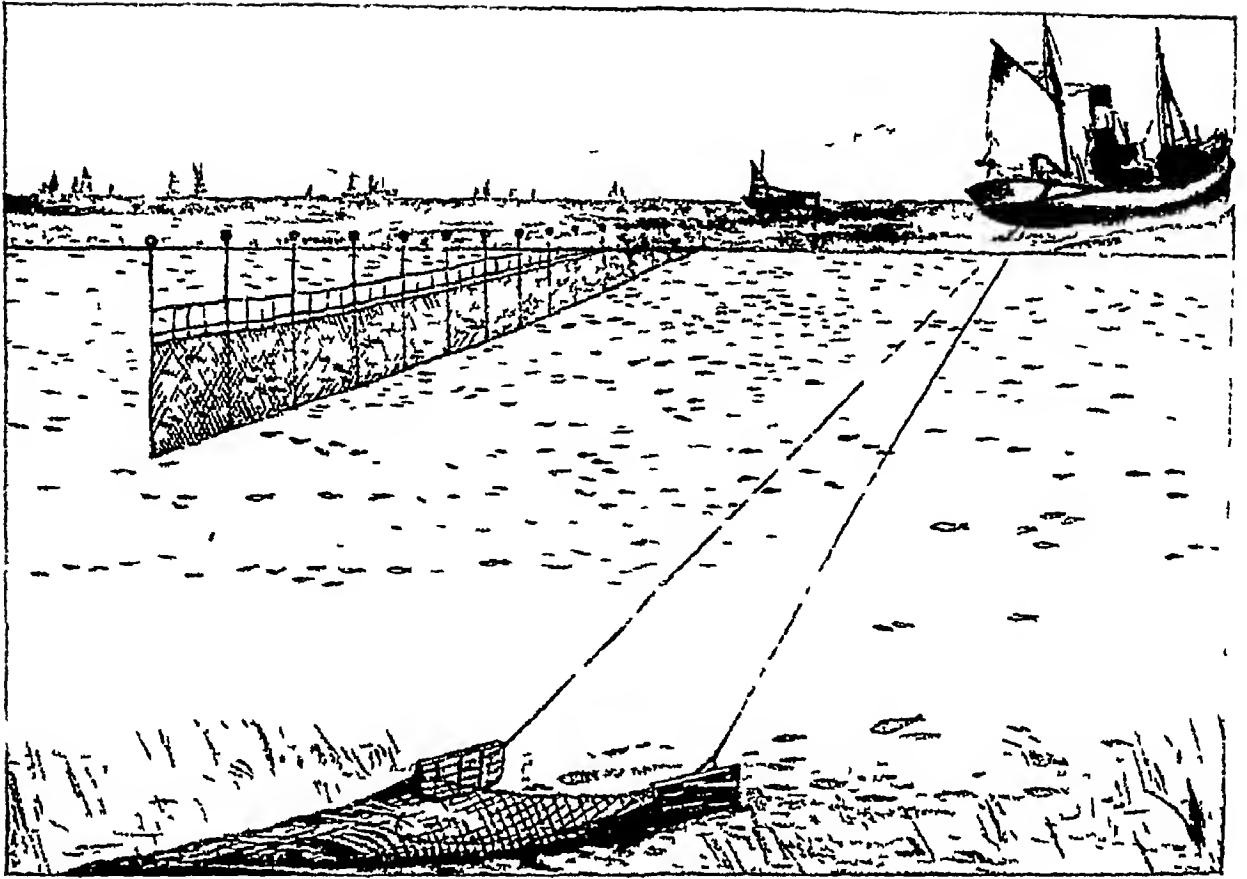


CATCHING SALMON FOR THE ALASKAN CANNERIES

## NURSERIES FOR MILLIONS OF BABY FISH



More and more, men are ceasing to rely upon the supplies of fish made haphazardly by Nature, and are "breeding" fish just as they do horses and cattle, dogs and poultry. Particularly is this the case in the United States of America, and (top) we see ponds for rearing young bass at a fish hatchery in Virginia, and below, equipment for hatching cod eggs in a fish culture establishment in Maine. The pipes seen maintain the oxygen supply in the tanks.



#### INGENIOUS WAYS OF GATHERING THE OCEAN'S CROP

At the top is one of the greatest fishing devices—the gill-net. The fish thrusts his head through the meshes which are too small to permit the body to follow, then when he tries to back out, his gills catch and he is trapped. This net is simply set out, with floats on top and weights below, and allowed to become "loaded" with fish. Other nets are drawn through the water by the fishing boats. Sometimes the net has a "draw-string" at the bottom to close it into a "purse" when the ends have been brought together. At the bottom of the picture is shown a dredge net, used to scoop up fish and other creatures from the sea bed.

Of flat fish, plaice and halibut are most important, the former being especially valuable in the British industry. These fish are caught in trawls, and as enormous numbers of small plaice are returned to the sea in a dead or dying condition, the species, like the herring, is in danger of suffering from over fishing.

Much the most important freshwater fishery is that for salmon.

The salmon of the Pacific coast of America are caught when they are entering the streams from the ocean to spawn. The fish move near the centre of the current, keeping close to the surface, and the fishing is done either by nets or the deadly fishing-wheel. This is a large wheel sunk in the river just below the surface at a narrow place. It has paddles, on the rim of which are set wide mouthed baskets which turn slowly in the current. It meets the fish as they swim upstream, lifts them and dumps them into a chute which leads to the shore. In Britain, salmon are netted in tidal estuaries, and caught in considerable numbers with rod and line. A most valuable Mediterranean fishery is that for the tunny, which is dried and tinned or eaten fresh in vast quantities.

Anchovy, sardine, and herring fisheries are also of commercial value.

Besides the fishes caught for food, many are sought for other purposes. The Chinese catch shark for oil and skins, while all over the world fish are caught for sport.

The artificial culture of fish for food—sometimes called pisciculture—is now a scientific pursuit of some importance. A female fish normally produces thousands of eggs which are never fertilized—or which, if they are, never reach the adult stage. It is the main object of fish culture to diminish this waste.

The fish are kept in captivity in most fish "hatcheries" only until they are ready to be released in the rivers and lakes. The usual method of hatching is for the spawn to be artificially extracted from a number of female fish, and the milt from the male fish is then mixed with it and placed in water. After about 30 minutes, the eggs are removed to hatching boxes. The eggs eventually hatch out after anything from six weeks to two months.

Freshwater fish like carp are bred extensively in central Europe, and various species of trout in the hatcheries of Great Britain and the U.S.A.

# CATCHING FISH *with* ROD and LINE

*"What can they see in it?" you ask, as you pass the fishermen sitting silent and motionless on their stools beside the river. Well, this article may explain in some measure the fascination of fishing*

**Fishing AND ANGLING** Whether you are a small child, angling with the traditional "worm on a bent pin," or a millionaire, landing a giant



tunny or sword-fish on board a motor yacht, you are taking part in the great sport of fishing, perhaps the oldest, certainly the most popular, sport in the whole world. But perhaps in no country has fishing been so developed as a sport as in our own, the literature of the sport alone goes back to Roman times, and in the English language there has been a

constant stream of books since the "Treatise of Fysshynge with an Angle," published in 1496. Among them stands out Izaak Walton's "Compleat Angler," while a minor modern classic is Lord Grey of Fallodon's "Fly Fishing."

You will probably start your fishing in one of two ways: either with a hand-line and rough, heavy tackle during one of your seaside holidays, or with a length of bamboo, a coarse line bearing a float and a single hook with a worm, in a stream or pond near your home. However you start, your first catch will be one of the great moments of your life. You may, of course, feel bored, in which case you should give up, for you cannot cultivate a love of fishing, it must be born in you. And if you have it, you will need only to see a stream or a calm, reed-lined lake, wherever you are in the whole world, to feel that longing for a rod and line, that innate urge to match your skill against the fish's brains.

As the most popular form of angling, we will take that in freshwater first. The most usual form of freshwater angling is that known as "bottom fishing"—although indeed you by no means always fish on the bottom. For this you need the straightforward tackle which you see

used by men and boys in all parts of Britain: a simple rod, of three or four joints, eleven to thirteen feet in length, a strong, but not too coarse line, a length of clear, strong gut, and a hook, also whipped on to a short length of gut, at the bottom.

Other accessories are the float, and some "split shot," soft little lead shot which are split open so that you can squeeze them on to the gut. You must first find the depth of the river, which you do by setting up rod and line, and using a leaden "plummet," attached to the hook. The whole is let into the water, very gently, so as not to frighten the fish. If the float is carried down below the water level, you must bring it up, adjusting it so that it is just an inch or two below, then the hook will be held just off the bottom of the stream. If the float is already adjusted too high, you will see your line lying slack and loose, you must then lower the float so that when the line goes slack so soon as you lower the tip of the rod, the float is on the surface of the water. In either case, your hook will be just right. The amount of float projecting above water depends on how many shot you have on the gut—usually an inch or two is enough.

Baits for bottom fishing vary enormously. You may use a worm, or "gentles," "mawks"



**DEATH BLOW FOR A PIKE**

Large fish, such as the pike, are landed with a steel hook or gaff (you can see it in the bottom of the boat, to the left) and killed by a sharp blow on the back of the head, as in the case of this fine specimen, caught on the Norfolk Broads. Notice the stoutness of the line, the angler's stiff rod, and his light but very powerful spinning-reel.



## FISHING

or maggots—which are the larvae of blue-bottles, or a paste made of soaked bread, squeezed dry, or a cheese paste, or even little cubes of bread-crust, cheese, or banana. One form of bait which is banned in many places, because fish seem unable to resist it—thus making sport a mockery—is hemp seed, boiled just enough to make the little white germ project through the hard, dark shell.

Besides your bait, you use a certain amount of "ground bait," which consists of bran, bread-crumbs, cheese parings, chopped worms, and some of the bait you are using on your hook. The object of this is to attract the fish to your part of the stream. This you achieve by throwing in a few handfuls when you first arrive at your "pitch," and more at regular intervals. In some rivers, and in lakes, too, it is as well to throw in balls of ground bait the previous day, mixing them with clay so that the water washes the food out very gradually, bit by bit.

The point of your float is not, as some people imagine, to tell you when you have caught a fish. It is to tell you when one is biting, and that is why, if you are to be a good fisherman, you must have proverbial patience and an ever-watchful eye. Round and round the float goes in an eddy, or steadily, perhaps, it swings down the stream. Then suddenly, down it bobs, down and up again almost before you can realize it. A lightning movement—but not a violent one—and you grip the rod, flicking the butt downwards so that the tip goes up. This is called "striking," and until you are expert at it, you will miss far more fish than you hook. At first, probably, you will not only be several seconds too late, but will jerk float, line, hook and all clean out of the water, and find them entangled in a tree above your head! The ensuing trampling on the bank, of course, will frighten every fish away for hours—but, none the wiser, you will return to your fishing, as likely as not, with new tackle, having left the other hanging high overhead!

But with experience you will acquire the art. You will in time learn that not every dip of the float is a "bite", that some may be due to deep eddies pulling at your line, or to a floating weed, you will know when the "nibbles" are just minnows, and when they are large but cautious roach, you will be able, in fact, to tell exactly what is happening, maybe ten feet down, by watching that slip of goose quill or cork, and automatically you will act correctly.

There are two main ways of handling your tackle when bottom fishing. You can either sit on the bank, or on a camp stool, some feet back from the water's edge, your rod supported on a forked stick, letting your float swim round and round in the same spot, or you can cast up to the top of a run of water, watching the float as it drifts down, lifting out and casting up to the top again. The method used depends on the state of the water, and of your mind, as well as on the fish you are after. But

practically all "coarse" fish, such as roach, dace, barbel, carp, chub, etc., feed near the bottom. With the "game" fish, on the other hand—salmon, trout and grayling—you are on the move the whole time, and, except for salmon, you will usually be fishing with a fly.

An artificial fly, an affair of feathers and silk tied on a hook so as to look, when it is in or on the water, like a real fly, is "cast" with a rod, finer, less stiff and lighter than that used for

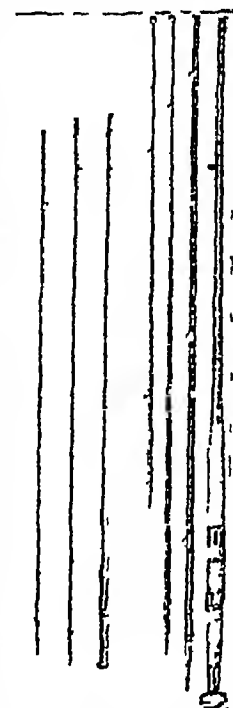
other fishing. Casting is an art that it takes years to acquire, as you can imagine when you hear that an expert can cast a fine line, several yards of gut and three flies at intervals along it, for many yards on to any spot that he desires.

In the place of the simple cane or greenheart rod for bottom fishing, you have often a split cane rod with a steel centre, so strong that it can be bent in any shape and will spring back to its original form. These features of fly fishing, and especially "dry" fly fishing, in which the fly is made to alight, and remain, on the surface of the water, have led the majority of people to think that fly fishing is a far more skilled art than any other type. But in places where the fish are very cunning and "educated" through much angling, roach fishing requires just as much skill and far more patience, and the expert roach fisherman may find it necessary to use tackle even finer than that used for trout.



### ITEMS OF FISHING TACKLE

Here are some things you will need when you go fishing: 1 and 2, types of float; 3, artificial fly; 4, artificial minnow for spinning; 5, a "Nottingham" reel for coarse fishing.  
*Courtesy of Ogden Smith & Ltd.*



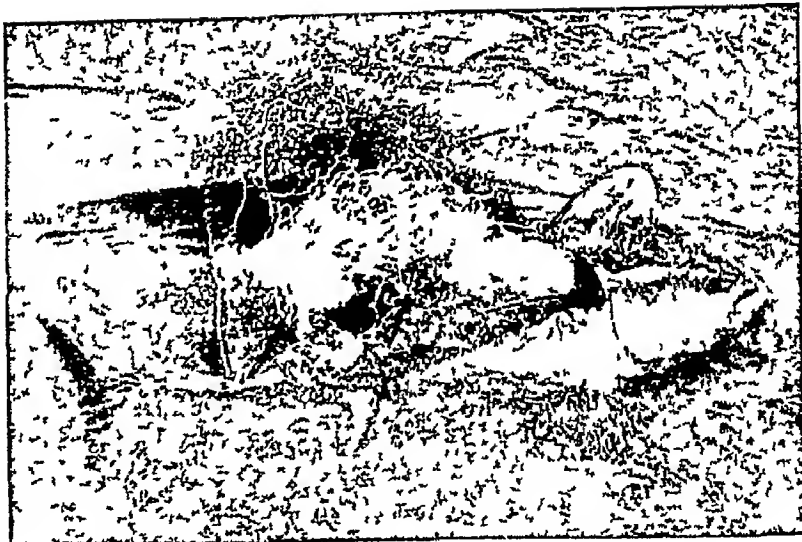
### FISHING RODS

Left, salmon rod with three joints; right, pike rod with two tops.  
*Courtesy of S. Allcock & Co.*



Salmon flies are not made to look like anything, but they attract these big fish, which do not normally feed in fresh water, and play on their bad and irritable tempers, so that they snap at them. You can also catch salmon on a prawn (real or imitation), or by spinning with a real or imitation "minnow"—not a minnow actually, but some other slightly larger fish. Trout, too, are caught by spinning, and so are pike, which are sometimes taken by trolling, that is, towing a bait behind a boat at a slow speed. Pike and salmon are landed with a steel hook called a gaff, other fish in a simple landing net.

Though your sea angling may start with a hand line at the end of the local pier, you will, if you take to this form of sport, eventually use a rod, a short, stout, heavy rod, for your captures may weigh several hundred pounds and your tackle must be of the strongest. Among the finest sporting sea fish are mullet, mackerel, tope (dog-fish), bass, halibut, codling,



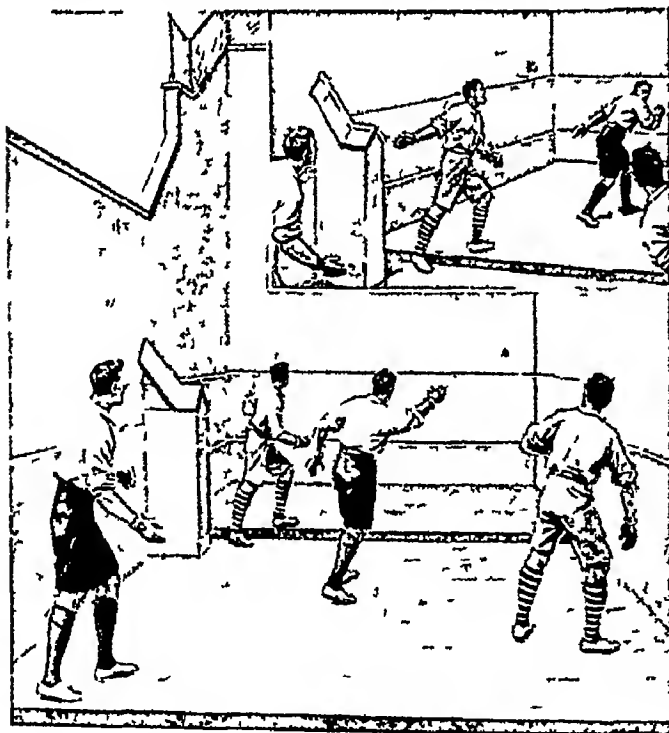
#### TUNNY'S BATTLE NEARLY OVER

Fishing for tunny is the most arduous branch of angling practised in British waters. Here is a fine specimen, almost exhausted after being played for many minutes, perhaps for several hours. The loop of line, whipping the spray above its head, indicates that the fish has come in faster than the angler could reel up his tackle.

and bream of various types, but the aristocrat of European seas is the tunny. There is now a good deal of tunny fishing, especially off Scarborough, and these giants run to well over 500 lb. They are caught from a boat, either a motor or a rowing boat, and may take many hours to land, and they are so strong that the angler sits usually in a special swivel chair, with harness to take the strain off his arms. The rod is only six to eight feet long, but the reel carries several hundred yards of line.

In America and New Zealand, especially, sword-fish, sail-fish and tarpon are other "big game" fishes which provide tremendous and exciting sport. But the millionaire who catches the big sword-fish is no more of a fisherman than the little boy with a bent pin, hauling out his first minnow or baby perch!

**Fives.** The game of fives is particularly popular in the English public schools, most of which have courts set aside for it. The origin of the name is doubtful, but it may be derived from the five fingers of the hand. There are various recognized forms of the game, the best-known being named after Eton, Rugby and Winchester. Eton fives is played in a court with three walls, the fourth end being open. There is a step dividing the floor into two parts, while a curiously shaped buttress, called the "pepper-box," projects from the left-hand wall. This is a reminder of the first Eton fives court—the outside wall of the college chapel. The Rugby fives court



#### A GAME OF ETON FIVES

In the Eton fives court there is a buttress projecting from the wall and also a step on the floor. These pictures show a doubles game in progress, with the partners taking opposite corners. In the inset a player is volleying for the buttress.

## FIVES

is covered in, and has four plain walls. Winchester fives is similar, but a buttress forms a hazard.

The object of the game is to volley the ball or hit it on the first bounce above a line or ledge on the front wall, in such a way as to prevent one's opponent (or either of one's opponents, if it is a doubles game) from hitting it back. A point can be won only when "in"—i.e. when serving, a game consists of 15 points. To serve, a player throws the ball as directed by his opponent against the front wall (above the line), in such a way as to ricochet off the side wall. Either hand may be used for striking the ball, special gloves (which may be reinforced with "inners") being worn.

**Flags.** In ancient times standards of various sorts and materials were used by the Persians, Greeks and Romans, the brazen eagles of the Roman legions being the best-known instance. But it was not until the Middle Ages that cloth banners and flags came into use, partly as a result of the necessity of distinguishing different forces in the Crusades. The emblems on our flags arose in part from the blazonings of heraldry.

Early flags often had a religious character. The banner of early England was the red cross of St. George on a white background, and the present "Union Jack" of Great Britain is formed by combining with this the diagonal white St. Andrew's cross on a blue background for Scotland, and the red diagonal St. Patrick's cross for Ireland. The Dominions, with the exception of South Africa, use the Union Jack with a blue or red ground on which is some distinguishing badge. South Africa has a flag of its own, in the design of which the Union Jack occupies a very small part. The frontispiece to Volume I of this work shows the flags of the British Empire.

The story of the origin of the Stars and Stripes of the United States covers the early history of the country. At first the American colonies used the English flag, but in 1777 the Continental Congress created the Stars and Stripes by passing this resolution: "That the flag of the thirteen United States be thirteen stripes, alternate red and white, that the union be thirteen stars, white in a blue field, representing a new constellation." When a new state came into the union a star was added.

In the following list, the year in which the present flag was adopted follows the name of the country. In some cases the design is very old.

Afghanistan, 1930, Albania, 1912, Argentina, 1816, Australia, 1908, Austria, 1921, Belgium, 1831, Brazil, 1889, Bulgaria, 1879, Canada, 1921, Chile, 1817, China, 1928, Cuba, 1906, Czechoslovakia, 1920, Danzig, 1920, Denmark, c. 1219, Ecuador, 1900, Egypt, 1923, Estonia, 1918, Finland, 1918, France, 1789, Germany, 1935, Greece, 1822, Guatemala, 1871, Honduras, 1866, Iceland, 1915, Irish Free

## FLAT FISH

State, 1922, Latvia, 1921, Liberia, 1847, Lithuania, 1918, Mexico, 1917, Nicaragua, 1908, Norway, 1821, Panama, 1904, Paraguay, 1842, Persia, 1907, Peru, 1825, Poland, 1927, Rumania, 1859, Santo Domingo, 1844, South Africa, 1928, Sweden, about 1523, Switzerland, 1480, Turkey, 1928, Uruguay, 1928, Vatican City, 1929, Venezuela, 1863.

**Flamingo.** A man who had been fortunate enough to see a flock of these great birds on the wing compared it to "a gigantic brilliantly rosy scarf waving to and fro in mighty folds as it flies away." For though the flamingo is pale pinkish when at rest, the brighter rose colour of the undersides of the wings shows up when it flies.

A full-grown flamingo is between 5 and 6½ feet in height. Its humped body is supported on long, thin legs, while its slender neck—pliable as a snake—curves upwards like a big letter S, and ends in a small head with a great flat down-curved beak.

The lower part of this beak forms a deep broad box, into which the upper part fits like a cover. When the bird is feeding on shell fish or water-plants in the shallow mud flats, the neck is twisted like a corkscrew until the head is upside down, then the top of the beak is pushed along through the mud like a scoop or shovel, gathering in the mud from which the food is filtered out.

There are several species of flamingoes, mostly living in tropical and sub-tropical countries. Of these the most beautiful in colour is the scarlet flamingo, which is plentiful in the West Indies and along the Central American coast.

Thousands of these birds gather in remote places during the nesting period. Each female builds a curious mound of mud like a tiny volcano, in the crater of which a single egg is laid. On this the mother sits with legs drawn up like a grotesque statue on a pedestal. The young are hatched in white down, with a straight bill which gradually acquires the crook.

**Flanders.** This name was given in the Middle Ages to a thriving district extending along the North Sea southward and westward from the river Scheldt to the Straits of Dover. Parts of Flanders are now included in the kingdom of the Netherlands and parts in northern France, but the greater part lies in Belgium, where about half the people still speak "Flemish," a tongue akin to that of the Dutch. (See Belgium.)

**Flat Fish.** Fishes of this type may be said to have formed, in the course of their evolution, the permanent habit of travelling and resting entirely on their sides. In conjunction with this an amazing thing has happened. If they lay normally on their sides, one eye, of course, would be buried in the mud where it was useless, and the mouth would be set at an awkward angle for feeding. We may imagine, then, that for generations these fish tried, while still lying on their

# NATIONAL FLAGS OF EUROPE AND AFRICA



ALBANIA



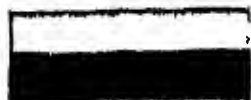
ANDORRA



AUSTRIA



BELGIUM



BULGARIA



CZECHO-SLOVAKIA



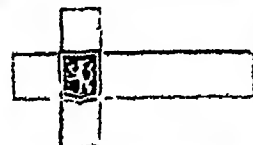
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DENMARK



ESTONIA



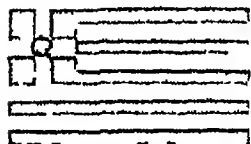
FINLAND



FRANCE



GERMANY



GREECE



HUNGARY



ICELAND



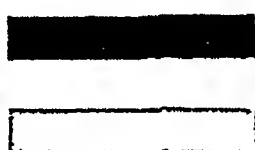
ITALY



LATVIA



LITHUANIA



LUXEMBURG



MONACO



NETHERLANDS



NORWAY



POLAND



PORTUGAL



ROMANIA



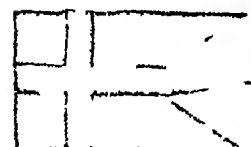
RUSSIA



SAN MARINO



SPAIN



SWEDEN



SWITZERLAND



YUGO-SLAVIA



ABYSSINIA



EGYPT



LIBERIA



MOROCCO



TUNIS

In this plate and the one overleaf the flags of the countries of the world are arranged by continents. The flags of the countries comprising the British Empire are contained in the frontispiece to Vol. I

## MORE BANNERS IN THE BREEZE



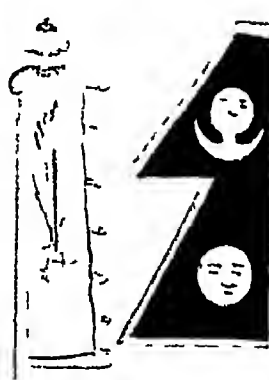
AFGHANISTAN



CHINA

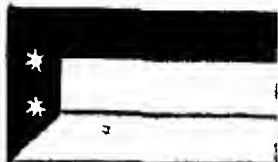


HEJAZ



BHUTAN

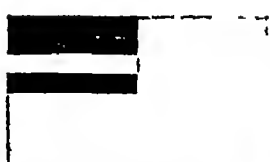
NEPAL



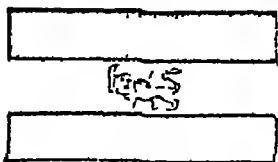
IRAQ



JAPAN



MANCHUKUO



PERSIA IRAN



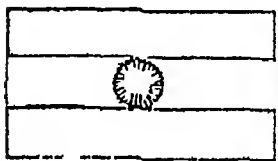
SIAM



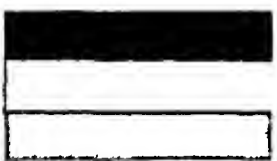
TURKEY



UNITED STATES



ARGENTINA



BOLIVIA



BRAZIL



CHILE



COLOMBIA



COSTA RICA



CUBA



ECUADOR



GUATEMALA



HAITI



HONDURAS



MEXICO



NICARAGUA



PANAMA



PARAGUAY



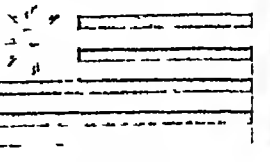
PERU



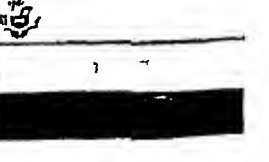
SALVADOR



SANTO DOMINGO



URUGUAY



VENEZUELA

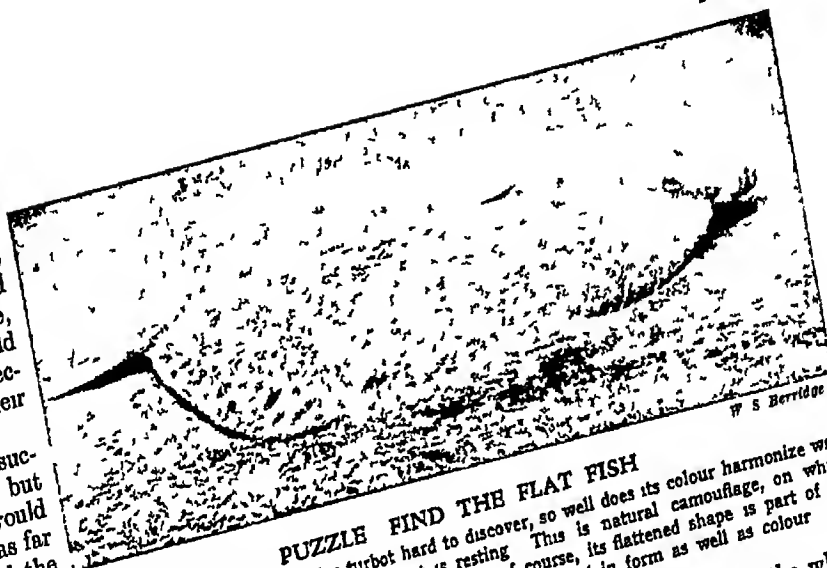
Continuing the series from the preceding plate, the flags of the countries of Asia and America are depicted above

## FLAT FISH

sides, to twist their heads round so that their buried eye would be where it could see, and the jaws would reach a more effective position for their work

They finally succeeded in part, but their heads would only twist half as far as required, and the lower eye was still half buried. So gradually this eye left its place and travelled round the top of the head until it came out on the upper side, next to the eye which was already there. Thus, with two good eyes to watch for danger, both looking upwards, these fishes got along very well

Such is the situation of the modern flat fishes, from the huge halibut to the flounder and the small sole. But although this transformation of shape probably took thousands of years, the young flat fish today inherit the early habits of



## PUZZLE FIND THE FLAT FISH

At first glance you may find this turbot hard to discover, so well does its colour harmonize with that of the sandy sea-bottom on which it is resting. This is natural camouflage, on which the flat fish depends for safety from its enemies. Of course, its flattened shape is part of the business, too, for the fish can assimilate itself to the sand in form as well as colour

mouth turns at an oblique angle, and the whole process of evolution is gone through again in the lifetime of each fish. This is the reason for the strange deformed shape of the flat-fish tribe

This family is a large one, consisting of nearly 500 species. A few of these live on their right sides, but the great majority prefer the left. The under side, which is not exposed to the light, is whitish, while the upper is usually dark, mud- or sand-coloured. However, this colour scheme, which is designed to make the fish invisible to his foes, changes with the surroundings. For instance, if a flounder is put in an aquarium with a glass bottom through which light is allowed to shine, the under side will turn brown

Almost all flat fish are valued highly as food. The European sole (*Solea vulgaris*) is considered by many to be the most delicious of all fish. The largest of the whole family is the lordly halibut (*Hippoglossus vulgaris*). Since the discovery that halibut liver oil was the richest known natural source of Vitamin A (also possessing a high Vitamin D content) halibut fishing became specialized, and special types of "halibut ships" were built on the Humber, but by far the most important commercially is the plaice (*Pleuronectes*). This species, recognizable by its red spots, is very common round our coasts, so is the flounder, which comes up many tidal rivers

**Flax.** A field of common flax in full bloom is like a great lake of delicate blue. It ripples softly as its dainty blossoms sway and nod to every passing breeze

These pretty fields are cultivated both for the dark-brown seed and for the soft strong fibre of the plant. Each bushel yields from 17 lb to 20 lb of "linseed" oil, which is used for mixing paints, making printer's ink, patent leather, linoleum and oilcloth. The oilcake is a by-product highly esteemed for fattening cattle. The fibre is, after cotton, the most generally employed textile in the whole range of vegetable



## WHERE IS THE PLAICE'S EYE?

Here is a young plaice, with its eyes on the top of its head, though not so far round as they will be when it is full grown. How this happens is described in the text. This picture shows, too, the spine and structure of the fins of this typical example of a flat-fish

those remote forefathers who swam upright. When they are hatched from the eggs these youngsters at first are upright in the water, like any normal fish, and have an eye on each side of their head. As they grow older, they come to lie on one side, and their head begins to twist out of shape, the under eye comes out on top, the



#### GLIMPSES OF IRELAND'S FAMOUS FLAX INDUSTRY

When flax fibres are desired for linen-making, the unripe flax is pulled by hand and stacked as we see in the upper left hand picture. When dry, its seeds are removed either with a hand comb or by such machines as the one in the lower left hand corner. The next process is "retting," or allowing the pithy core to rot in water. Retting in stream water is shown in the upper right corner. The last picture shows "scutching," in which machines break the rotted pith from the stem and leave the fibres to be combed.

fibres. From it is produced linen, so widely used in making choice table cloths and napkins, towels, handkerchiefs, exquisite laces and a great variety of other articles. (See Linen)

If only the flax seed is to be used, the crop is harvested with a mower after the seeds are ripe and brown. But if the fibre is to be used the plants must be pulled by hand before they are quite mature. The pulled flax is then tied together in bundles and left upright in the field until it is dry, when the seeds are separated from it, or the separation is made just after pulling, with an iron comb, called a "ripper."

Next the flax is "retted," or soaked, by various methods, usually in tanks, pools or rivers, until through the action of bacteria the fibre is loosened from the decaying woody part of the stalk; it is then spread out on the grass to bleach and dry. The pure fibre is next freed from the core by two operations—"breaking" (cracking the woody portions of the stems), either by hand or by revolving grooved rollers, and cutting lengthwise by a "scutching blade" or a "scutching machine." Finally, the flax is "heckled," or combed with an iron comb. The

short coarse fibres furnish the "tow" that is sometimes used for home-spun clothes.

The chief flax-growing countries are Russia (which once produced two-thirds of the world's flax), Lithuania, Latvia, Estonia, Canada, Holland, Ireland, Argentina, Egypt, British India, Belgium, Central Europe and the United States. Flax has been cultivated in Europe since the Stone Age, and of recent years it has been re-introduced in England, notably at the King's farm at Sandringham.

**Flea.** This insect (*Pulex irritans*) is one of the most troublesome members of the whole insect world. In recent years it has also been recognized as one of the most dangerous, for it spreads the bubonic plague by carrying the germs of this dread disease from rats to man.

Fleas are very tiny creatures, with their bodies very thin and flattened from side to side (as a fish is flattened). This shape makes it very easy for them to slip about among the hairs of the creatures upon which they live. All fleas are parasites, getting their living from the bodies of other animals. They have no wings, but they are wonderful jumpers by



## LONG-LEGGED FLAMINGOES FEEDING IN THE MUD



Every creature's bodily structure shows to some extent the influence of its feeding habits and in wading birds such as the flamingoes this is more than usually obvious. The long legs bear the body high above the water, the slender neck, counteracting this, enables food to be sought among the mud at the bottom of the pool. The beak itself too is adapted for the rapid and efficient filtration of the muddy water.



**WHEN EVENING COMES TO THE FLAMINGOES' LAKE-SIDE HOME**

Here is a typical scene by the side of a lake where flamingoes are breeding. The mother flamingoes are on their nests, the fathers are standing about gossiping, and the children are playing a few evening games before going to bed. Notice what neighbourly birds they are—all crowded together, hundreds and hundreds of them, and yet getting along quite peacefully. The nests are built of scraped up mud with a shallow cup at the top. You can see an egg lying in the third one from the left. In the second from the left is a young bird, just hatched. In the middle are several mothers squatting on their homes, one of them is already asleep, with her head tucked under her wing. Another is stretching down her long neck scooping up a bit of food. This picture is from a group in the American Museum of Natural History. The front figures are stuffed specimens, while the background consists of a painting models and picture being skillfully blended to form one realistic whole.

## FLEA



### WHAT THE FLEA IS LIKE

Here is a flea, highly magnified and set up on a microscope slide. At the front of its head are the antennae and the biting organs, more conspicuous are the powerful legs with which it makes its great hops.

reason of their long, powerful hind legs. Their heads have a long, sharp, sucking beak, with which they puncture the skin and suck blood.

The female flea scatters her eggs about in rugs and carpets and in places where animals sleep. The larvae, or young, look like little hairy worms, they have biting mouth parts, normal legs, and live on refuse of all sorts. Fleas especially infest rats, dogs, cats, rabbits, pigeons and poultry, and each type of animal has its own species. As a group, they form the order *Aphaniptera* (Greek for "invisible wings").

**Flint.** A mineral, a variety of quartz, consisting almost entirely of silica with a little lime, oxide of iron, water, and sometimes carbon. It varies in colour from almost black to light brown, red, yellow and greyish white, and is sometimes mottled or spotted, but is commonly grey or smoky brown. Flint was largely used by prehistoric peoples to make axes, arrowheads, knives and other implements, and indeed it is possible to tell, by the type of such instruments which accompany them, the periods to which prehistoric burials belong.

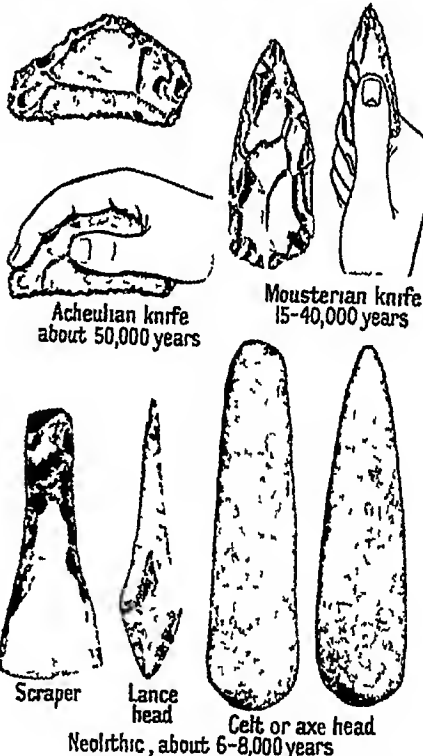
Flint breaks with what is called a "conchoidal" fracture, giving the broken mass something of the appearance of a sea shell, and one of the first things to learn is how to tell a Man made from a natural fracture. Often Nature imitates very closely such fractures as may have been made by prehistoric men.

There has been much controversy as regards the earliest flint implements, for there is often little about them that seems to indicate any definite purpose in the way in which the "flaking," as the flint-chipping is called, was done. However, there must have been some

## FLINT

point at which men did begin to "work" the flints, and those which are claimed as the products of the first period are termed *coliths* (dawn stones). They are for the most part very large and rough, and bear signs of much wear.

In the second period, the *Palaeolithic* (Old Stone) era there is little doubt about the fact that the working was deliberate, although it is usually possible to make a whole series going back to the *colithic* types. One feature of a worked flint is the *bulb of percussion*, the point where the implement was struck off the larger original *core*, or the corresponding point on the core itself. Implements of this period vary enormously in size and type, from big, rough axe heads to small "scrapers" and early arrow heads. The scrapers, characteristic of this period, were usually small tools, flat on one face, more or less rounded off on the other, with a thick, blunt edge useful for scraping hides and similar work. Often, too, you may find the round, battered "hammer-stones" used for working the other flint. In later *palaeolithic* work the edges of the tools are amazingly finely worked, the edges being removed as "flakes," tiny shivers of flint, and thus worked into a smooth, sharp, or saw like edge as required. The flakes from larger pieces



### FLINT IMPLEMENTS IN USE

Many thousands of years ago, these and other types of flint implements were all that Man had for fighting his enemies and feeding himself. You can see how he held them and what they were used for. There are many parts of England where, if you are observant, you may find such "flints" as these.



#### AT WORK IN A NEW STONE AGE FLINT-MINE

The earliest flint weapons were made from stones found near the surface, but later men of the Flint Age found that by digging deeper they could get stones of better quality and flint-mining became an extensive industry. Where the flint lay close to the surface shallow pits were sufficient, but sometimes methods similar to those obtaining in modern coal mining were employed on a small scale, and a shaft as much as 30 feet deep was dug with galleries radiating from it. This illustration from the diorama in the London Museum, shows a typical Neolithic (New Stone Age) flint mine.

were themselves worked into little knives and small scrapers, or even teeth to be embedded in wood for making saws.

Fine as is the work of the palaeolithic period, it cannot compare with that of the *Neolithic*, or New Stone, age. Here, the axe heads and other implements are smoothed and sharpened down to a beautiful edge, cut so as to fit the wooden hafts and generally worked in a manner which commands our admiration to this day. To the types already mentioned must be added sling stones, worked to give the greatest effect from a sling, a stone of this type must have been used by David in slaying Goliath.

In many parts of England, especially where there are gravel deposits or on the chalk hills, you may find flint implements, and on these hills, too, the prehistoric flint-mines have in some places been discovered. You may even find for yourself places where the flint-makers' workshop has been, with discarded implements, the "cores" from which the flakes have been struck, and other debris lying round. Sometimes the ground is newly turned up, in other places the flints have their surface broken in colour—weather-worn with what is called a

*patina*—a sure sign that they have been long on the surface. If they look very newly chipped, and are on the surface, they are probably only the result of natural action.

Flint has also long been used for striking against steel in making lighters of various sorts, and for old-fashioned muskets (flint-locks).

**Flintshire.** This border county of Wales, the smallest in that country (255 square miles in extent), is unusual in having a detached area to the south-east of the main part. In Flint are the rivers Dee and Clwyd, the former having a wide estuary. Mold (pop., 5,000) is the county town, other places are St Asaph, seat of a bishop, and Rhyl, a popular seaside resort. Population of Flintshire, 112,000.

**Flodden, BATTLE OF** Fought September 9, 1513, at Flodden, a ridge of the Cheviots on the English side of the border, this famous battle was a victory for the English army under the Earl of Surrey over the forces of James IV, king of Scotland.

The English crossed the river Till, and took up a position between James's army and their line of retreat. The Scottish left wing attacked the English right, and forced it back, but mean

# BRINGING THE BITTER NEWS OF FLODDEN FIELD



In the battle of Flodden James IV, king of Scotland, and the flower of his nobility were slain in conflict with the English army. The Earl of Huntly, one of the few Scottish leaders to escape, hurried back with the news to Edinburgh, and is here seen giving the dreadful tidings to the City Fathers. He shows them their standard, and tells them not to gaze upon it lightly, for the blood they see upon it is the life-blood of their king.

*Reproduced by special permission from the painting by William Hole in the City Chambers, Edinburgh.*



## FLODDEN

while the English routed the Scottish right and caused the centre and left to give way. The Scottish army lost between 8,000 and 10,000, James IV being among the killed. The English losses were comparatively few.

**Florence, ITALY** "The most beautiful and most famous daughter of Rome," as the poet Dante proudly called his beloved Florence, lies upon both banks of the Arno, which is spanned by six bridges, of which the Ponte Vecchio, built in 1345 and flanked with shops like old London Bridge, is world-famous. On all sides low hills covered with villas surround the city, which in Renaissance times was the artistic and intellectual capital of the world.

From these hills about Florence the scene is one of striking beauty. In the heart of the city rises the amazing dome of the big 13th-century cathedral, and by its side is the exquisitely beautiful "campanile," or bell-tower, built by Giotto. Near by is the baptistery, with Ghiberti's celebrated bronze doors.

Every tower and every roof-tree in the old part of the town has its history. The narrow streets of this proud mercantile republic were filled for four fierce centuries with the conflicts of Guelf and Ghibelline, of the Neri (black) and the Bianchi (white) Guelfs, of the partisans of the Medici and the defenders of the republic. In such and such a house Dante lived, and over there Petrarch wrote one of his many sonnets

## FLORENCE

to Laura, his lady-love. Here Michelangelo carved his famous statue of the youthful David. There Leonardo da Vinci learned to paint. In the great public square before the civic palace Savonarola, the statesman-friar, was martyred amidst the jeers of the populace. From this spot a short walk will lead to the house of Vespucci, famous as the home of the Amerigo Vespucci who gave his name to the continents of North and South America. In Florence Machiavelli wrote his celebrated work "The Prince."

The list of famous places and famous names is almost endless. Florence, the birthplace of the Renaissance, was not only Italy's capital in arts, but in science, literature and statecraft, in skilled trades and in commerce.

Today the shrewd and enterprising qualities which made the early Florentines leaders of Italy are still in evidence. The modern Florentines carry on a lively trade in woollens, keeping up the tradition of the celebrated Woolweavers' Guild, the most powerful of all their great guilds in the Middle Ages. Silks, wood products and, above all, objects of art are exported.

No other Italian city except Rome attracts so many art lovers each year. Its two famous picture galleries, the Uffizi and the Pitti, contain collections of priceless value. Almost every church in Florence has famous frescoes on its walls, while the tombs of the city's great men are embellished with notable sculpture.



**EUROPE'S FOURTH LARGEST CATHEDRAL IN THE HEART OF FLORENCE**

This photograph shows the delightful situation of the city of Florence, lying in a valley among the Apennine foothills. In the centre of the photograph is the cathedral of Santa Maria del Fiore, founded in 1298. It is the fourth largest church in Europe. The lovely campanile, seen on the left of the building, was designed by Giotto, who has been called the father of the Italian Renaissance, and it was built between 1334 and 1387.

*Courtesy of ENIT*



## FLORIDA

Michelangelo's celebrated statues over the tombs of Giuliano and Lorenzo de' Medici, in the church of San Lorenzo, are among the world's masterpieces of art

The population of Florence is about 320,000

**Florida.** More than 400 years ago, on Easter Sunday (in Spanish, *Pascua florida*) of the year 1512, the Spaniard Ponce de Leon, seeking the fabled Fountain of Youth, first beheld the land which he named Florida, in honour of the day The Spaniards held Florida until 1763, when they yielded it to the British

The new occupation brought prosperity, and Florida remained under British control during the War of Independence, but was ceded back to Spain in 1783 Florida in foreign hands was a grievous thorn in the side of the young American Republic West Florida was seized in 1810-13, but not until 1819 did the United States negotiate a treaty with Spain ceding this and the remainder of Florida for the equivalent of £1,000,000

Florida's potential wealth was scarcely touched until 1875, when it was discovered that oranges could be grown profitably in the semi-tropical belt across the middle of the state Next a market developed for grape fruit, grown in the southern part of the state Then it was found that pineapples could be raised in abundance along the east coast Now Florida is a paradise of strange exotic fruits

Its mild winter climate makes Florida a world playground somewhat comparable to Italy But swamps are common in many parts of the peninsula In southern Florida, west of the Everglades, is the vast Big Cypress Swamp, crowded with buttressed cypresses, giants of the tree world and relatives of the famous California sequoias The Everglades, a level, grassy plain of about 5,000 sq miles, slope gently southward from Lake Okeechobee and finally merge with the mangrove covered Keys in Florida Bay

A few Indians and whites live in this tangle of streams and lagoons After the close of the Seminole War in 1842, a few hundred members of the tribe escaped removal to reservations by fleeing to the inaccessible heart of the Everglades Here they have lived ever since, poling their way through the dense saw-grass, hunting deer and other game, fishing and tilling little plots of the rich island soil

Tallahassee, with a population of about 11,000, is the capital of the State, while the chief pleasure resorts are Miami (pron mi-am'-i), with a population of 11,000, and Palm Beach (26,000) The sands on the Atlantic coast are gloriously smooth and wide, Daytona Beach has been used for many motor-racing speed trials Florida has an area of 58,666 sq miles, and a population of 1,607,000, about 40 per cent of whom are coloured

## FLOUR

**Flour AND FLOUR MILLING** The golden wheat as it comes from the fields must be changed into flour before bread, our principal article of food, can be made from it The process of grinding the kernels into flour and separating the fine flour from the coarser portions is called "milling"

In early times a stone was hollowed out and a smaller stone, with one end rounded, was used to pound the grain, which was then mixed with water and baked on a hot stone (*See Bread*) A little later a hand mill, called a "quern," was used This consisted of two disks of stone, one on top of the other, with a hole in the middle, through which the grain was fed The upper stone was rotated on the lower by means of a handle Next came large mills made on the same plan, with stones with grooved surfaces to give a cutting edge, and turned by oxen or water power or the wind

### Rollers Instead of Stones

It was not until 1870 that the "roller process" mills, which today grind nearly all the world's flour, were introduced Rollers made of chilled steel with grooved surfaces grind, or mill, the grain as they revolve against each other

Before we can fully understand milling, we must know something of the size, form and composition of a grain of wheat We learn that it is an oblong little grain with a furrow down one side, and that on the outside is the brownish husk, called bran after milling, consisting of layers of woody fibre Within this husk lies the

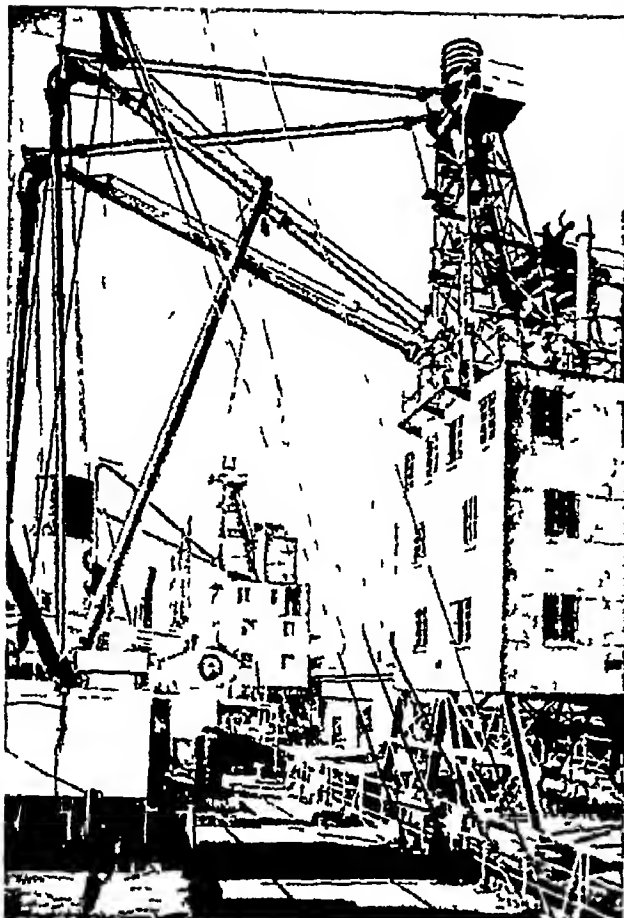


### PRIMITIVE FLOUR MILL

In this camp in the Syrian desert corn is still ground in a primitive fashion Outside their rough tent these women are working the upper and nether millstones by hand, much as their forebears did in Biblical times, and they are evidently enjoying their task.

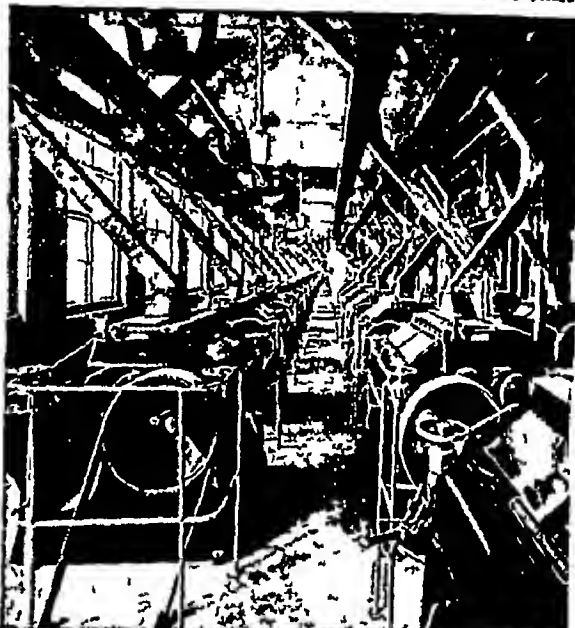
Photo Newtonian Illustrated Press Service

## FLOUR



peel off whole and are easily separated. The grain is then dried in a drying room, where an automatic device separates from the flowing stream just enough to make one sack of flour. Let us follow this wheat through the mill.

It drops down one floor after another, each time passing through a set of rollers called "break rolls." The grain cannot be ground very fine at first, because the bran must be taken



white kernel, composed chiefly of gluten and starch, from which white flour is made. Tucked in one end of this kernel is the wheat-germ, which, if the grain were planted, would produce the new plant.

In milling, the bran and most of the wheat germ must be removed from the starchy white kernel in order to obtain a fine white flour.

Let us see how flour is prepared in the big modern mills. These are so arranged that one part of the process is done on one floor and the next on the floor beneath, so that gravity can be used to convey the grain from one machine to the other.

When the grain first comes to the mill it may contain dirt, particles of straw, and other seeds. These must all be removed before the grinding begins. This is done by sifting and shaking the grain, and fanning it with strong currents of air. The wheat grains are scoured bright and clean in rapidly whirling cylinders. Then they are moistened with steam to toughen the coats of bran, so that when the grains are crushed they



### PHASES IN FLOUR-MAKING

Here you see (top left) an everyday sight at Avonmouth grain wharf, with a traveling crane whose "pneumatic" arms suck up grain, like a vacuum cleaner, from the holds of ships alongside. Behind towers the great mill (top right), showing batteries of the roller mills which make flour from the now husked, bleached wheat. Below is a flour-loading scene outside a German windmill.

Upper photos courtesy of Henry Simon Ltd.

off and the wheat germ separated from the valuable kernel of starch and gluten in the early stages. And so each "break," or set of rolls, is adjusted to grind a little finer than the one before. The wheat germ is tough and flattens out instead of "crunching," and is quite easily removed by sifting.

At each "break," part of the wheat is reduced to fine white flour and part still remains in comparatively large granules. The fine flour is separated by "bolting," that is, by passing it through very fine sieves of specially made silk. The "middlings," or coarser flours of the kernels, are then separated from the "tailings," that is, the bran and other rejected parts of the wheat, and passed on to another set of rollers to be further reduced. This process is repeated again and again, until all the wheat has been reduced to flour or to its by-products. The last machine feeds our flour into a sack, all ready to go to the bakehouse or grocer's shop.

The by products, known as milling offals, are being increasingly used to feed cattle, pigs and poultry. The great milling concerns in Great Britain are now among the largest animal food manufacturers, blending their milling offals with protein foodstuffs to produce completely balanced animal rations.

In most flours the bran and the germ are almost entirely removed, but in some flours they are retained and ground up fine with the rest of the wheat, forming what is called wholemeal flour.

In the course of a year the United Kingdom imports over 5,000,000 tons of wheat, principally from Canada, Australia and the United States.

## EARTH'S *Bright* GARMENT of FLOWERS

*In the following pages the anatomy of a flower is explained, and the story—one of the most wonderful stories in the world—of its growth from seed to full-blown beauty is told in simple language*

**Flowers.** The objects which we call flowers are, for the most part, the "attractive" organs of the higher plants, but the term is used generally



A Posy of Polyanthus Narcissi  
Kodak Snapshot

in a very broad sense. Thus, we should talk perhaps of the flowers of the cone bearing trees, when these are really very different in development from those of other plants. But in every ordinary flower each part has a special "function." Thus, the brightly coloured parts of the flower are usually the "petals," and it

is their mission to attract insects, by their form or colour. Many flowers also attract by scent, which comes from glands in various parts of the flower. Not only have colour and fragrance been developed, but also the shapes of flowers have been modified for the convenience of the pollen bearing insects. The deep throated flowers, such as the petunia, are fitted for the long tongues of moths and butterflies, the deep nectary of the nasturtium, for the convenience of the humming bird, the lower lip of the sage flower, for the bee to alight upon. In fact, almost all flowers are shaped with reference to securing pollination (fertilization).

Since the use of the petals is to attract the flower's helpers, we naturally find the most important parts of the flower set in the midst of the petals. These consist of, first, a "pistil," comprising the basal part called the "ovary," in which the seeds are developed and perfected, and the tip, or "style," terminating in the "stigma." The last is a sticky, spongy tissue

which catches the pollen grains and holds them while they send down their tubes to the "ovules" in the ovary, carrying the material necessary for fertilization.

The second essential part is the "stamen," which consists of a "filament" bearing the "anther," which usually forms a double pocket in which the pollen grains grow. When the anther is ripe the pockets open, letting out the pollen dust to be carried by insect or wind to some waiting stigma of the same species. The pollen grains are so small that they look like dust, but each grain is of definite form and in some species is ornamented with knobs or recognizable markings.

The arrangement and number of pistils and stamens in different flowers show an amazing amount of variation. In many of the most familiar garden plants, every part of the reproduction system is found in each flower, the pistil rising from the centre, surrounded first by stamens, and then by a ring of petals. Some flowers, however, have just one or more pistils but no stamens, and they are called "pistillate", others have stamens and no pistils, and are called "staminate." Sometimes both pistillate and staminate blossoms grow upon the same plant, and such plants are called "monoecious," meaning that they bear both male and female reproductive elements. In other types each plant produces only one kind of flower, and plants of this sort are therefore called "dioecious."

To guard these parts from harm while the young flower is developing, many flowers have "sepals," which are tougher and firmer than the petals and completely cover and protect the very young bud.

Sometimes, as in the tulip and lilies, these sepals take on the colour of the petals as the

flower opens, and in others they alone are developed and are coloured brightly as the petals would be. In some species they are altogether absent. The sepals combine to form the "calyx," and the petals taken together form the "corolla."

The forms and arrangements of flowers are almost infinite in their variety. Some plants, such as the clovers, geranium and verberna, have such small blossoms that singly they could not very well attract insects, but, growing in clusters, they make quite a show. Such flower clusters are sometimes in the form of close "spikes" or "spikelets", sometimes as "racemes," with the blossoms distributed loosely upon an elongated axis, sometimes in the form of pyramidal clusters (like the lilac), called "panicles," in which the arrangement of blossoms is regular.

The *Compositae* form a large plant family that has advanced a step farther and adopted a co-operative plan for its flowers. The tiny florets, as they are called, are set close together in a solid head, those at the centre being perfect flowers, while those set in the rim develop long petals of bright colours to attract the insects. The sunflower is a good example, the outside row of florets produces the petals which form the "rays" of the sunflower, while the inside flowers, which are called disk florets and have an abundance of nectar, develop the seeds. The dandelion, thistle, dahlia, chrysanthemum, marigold, daisy and a host of other common flowers are of this sort. Strictly speaking, therefore, we should talk, not about a daisy "flower," but about a daisy "flower-head" (See also under the heading Botany).

## The Life-story of a Flowering Plant

**T**O trace the life story or life-cycle of a flowering plant, let us begin with the tiny seed. Like all other living things, a plant must eat and drink in order to live. Long before the first shoot appears above the surface of the earth the seed is at work. It begins by pushing out a root which, delicate as it is, forces its way through the ground. Its tip is protected from injury by a sheath known as a root-cap.

This root gives out branches, which in their turn branch again and then again, until the soil round the seed is a network of delicate threads.

The root is a very important part of the plant. In the first place it fixes the plant to the ground, and supports the stem which presently springs up. In the second place it gathers the nourishment which the hungry and thirsty young plant needs to make it grow.

Growing out from the roots of many plants are little thread-like structures so delicate as to require a powerful magnifying glass before they can be seen. These are called "root-hairs," and through their thin walls they absorb the rain water that has soaked into the ground, together with the chemical substances dissolved in it.

### The Stem and What it Contains

But while the roots are burying themselves in the soil, another little shoot is pushing its way in the opposite direction. This is the stem, which is working upwards towards the light, and before very long the tip appears above the surface of the earth. Hidden away in this stem are the leaves and flowers, which, unborn as yet, will later expand under the welcome rays of the sun.

Flowering plants are divided by botanists into two classes. There are those, such as the sunflower and the scarlet runner, which have two seed-lobes. These are called dicotyledons. Others, such as the lily, have only one seed-lobe, and are called monocotyledons.

Both of these have "pipes," or food channels, running through them, by means of which nourishment can pass up and down. These pipes are contained in bundles called "vascular bundles," and one of the differences between dicotyledons and monocotyledons is that, while in the former these bundles are arranged in a circle in the stem, in the latter they are spread about anyhow.

Before very long a tiny bud pushes its way out of the stem, and, aided by the light and warmth of the sun, quickly expands into a leaf.

Leaves are of all sizes and shapes and have a very important function to perform, both for the plant and the outside world.

### What Flowering Plants Breathe

The air which we breathe consists for the most part of oxygen and nitrogen, with a small amount of carbon dioxide, a gas very poisonous to animals. The leaves of plants "swallow" this carbon dioxide gas which is exhaled into the air by humans and animals, and take away the carbon from it, to use as plant food. The oxygen which is left is returned to the atmosphere, thus purifying it. In this process, called *photosynthesis*, sunshine and the green colouring matter in the leaves called "chlorophyll" play the principal parts. Photosynthesis derives from two Greek words which simply mean "building up with the aid of light."

Returning now to the life-history of our plant, we find the first leaf followed at rapid intervals by others, as well as by lateral stems, and eventually by flower-buds. What these buds contain we have already seen, and we also know the various parts of the flower and their general use. It remains to describe the way in which pollination takes place. In most flowers, where both stigmas and anthers are present, either the former or the latter ripen first. The

## FLOWERS

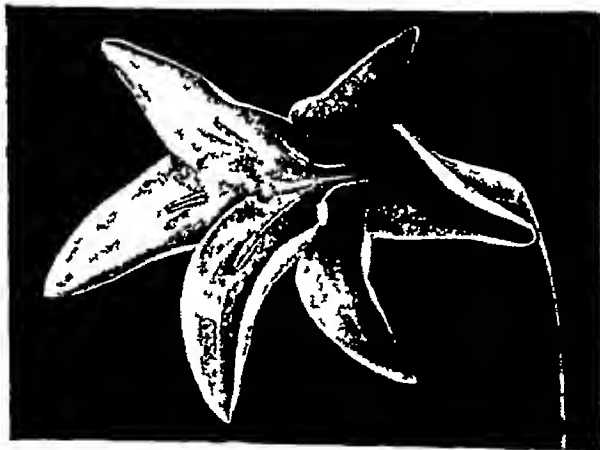
reproductive organs of the two sexes never ripen together. If the stigmas ripen first, the flower is said to be "protogynous", if the anthers, it is "protandrous". In either case, sooner or later, if it is an insect pollinated bloom, a bee or other insect will come along. If this is a bee, it will enter the flower in such a way that, brushing against the ripe anthers, it knocks off some of the pollen on to some part of its legs, back or underside. When it visits another flower, this pollen is in such a position as to come into contact with the surface of a stigma, and in this way cross pollination is assured, the sticky stigmatic surface picking up the pollen off the bee.

The pollen which has been picked up from the bee by the sticky surface of the stigma begins to grow, and sends out a little tube. This makes its way through the surface of the stigma and soon reaches the hollow style, growing on downwards until it reaches the ovary.

### When the Flower is Fertilized

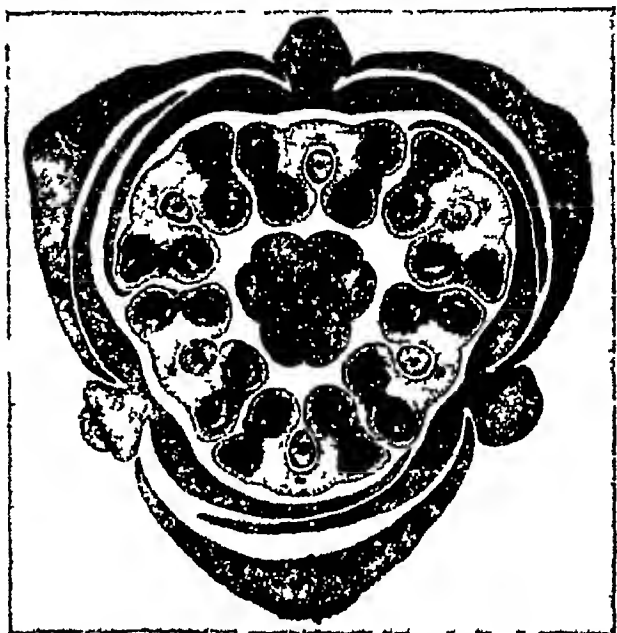
The ovary has a wall to protect it, but the pollen tube pushes its way through this wall, to reach an ovule. For inside the ovary are ridges, and on these ridges cluster the little green ovules. These are the forerunners of the seeds, but, unless they meet the pollen tube, they are doomed to die. When the pollen tube reaches an ovule, the male element passes in and fertilization takes place. Then the ovule begins to swell and grow, to produce, when the time comes, a new and similar plant.

From now onwards the petals fade and droop, and before long fall to the ground. We may say that the flower is dead, but we should be wrong—it is more alive than it has ever been. The change merely means that the beautiful colours have done their work, and so are no longer required. The calyx, however, may enlarge now to protect the growing embryo, and in many plants it forms part of the fruit.

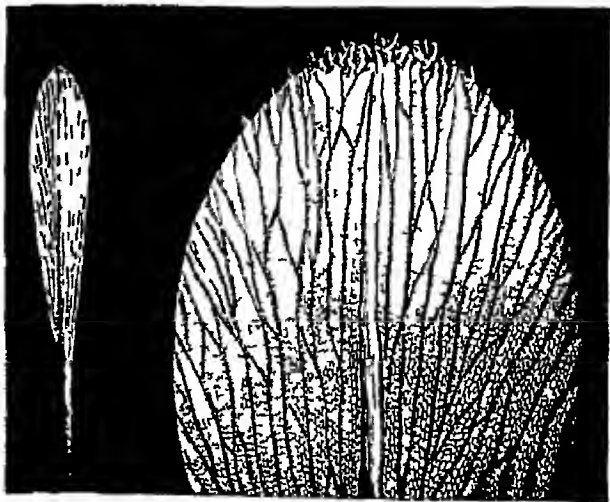


1 This is a Bermuda lily. On the outside are three coloured leaves—the sepals, inside these are three other leaves something like them—the

petals. Sheltered within these protecting leaves are six slender rods—the stamens, they are something like pins with long double heads—the anthers. In the middle of these rods are three sticky little stigmas. They rise from the columnar style, which runs down into a hidden case, the ovary, the very home of life. We shall see the wonderful things that happen in this hidden box, the silent factory in which Life works out its wonders. It is inside the swelling at the end of the stalk. The following illustrations show you, at various magnifications, the inside of this flower.



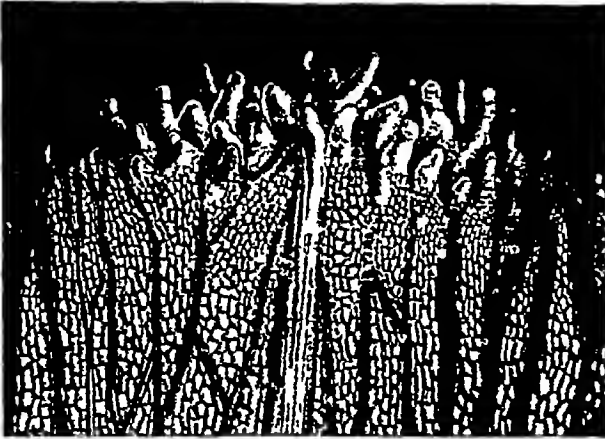
2 The inside of the flower-bud is like this, this is a slice across it. Going into it from the outside, we pass three sepals, three petals, and six anthers, and then come to the central style, at the top of which are the stigmas, and at the bottom of which is the ovary.



3 Here is one of the petals, on the right is the petal as we see it under the microscope, showing the veins that point the way for the bee when it comes to find the nectar deep down in the flower.



## FLOWERS



4 Let us look still closer at these petal-tips, their framework is beautifully built



5 Adding to the power of our microscope again, so that we can see still farther into the petal, we find that these veins are wonderful things. Here, in the middle, is a forking vein made of four marvellous tubes built up like a spiral staircase. They carry food to the petals up from the root.



6 If we cut this slender petal in two and put the edge of it under a microscope, this is what we see in this thin edge like paper. The black patches scattered along the strip are the delicate veins.



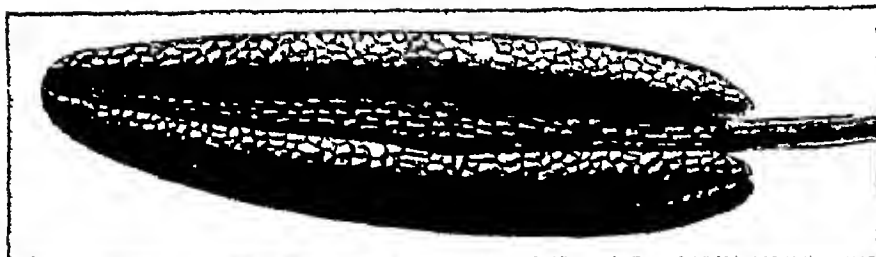
7 Now look closely at the six anthers, six little factories we may call them, clustered round the style that swells above them till the three-fold stigma bursts out at the top. Take your watch out of your pocket and think. Look at the works inside, and then say to yourself, "The works inside these anthers are more wonderful still."



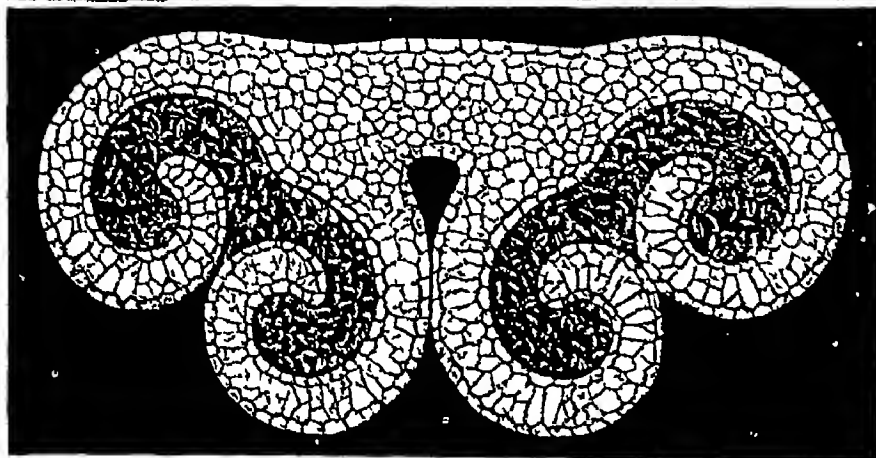
8 Inside these anthers are made the little grains of pollen we see lying in the anther here—the yellow powder that sticks to your finger if you touch it. We may think it is nothing, but is there anything in the world more wonderful? A speck of dust, a great man says, has power enough within it to break a continent in two, and this speck of pollen has the power to feed, to work, and to build up Life itself.



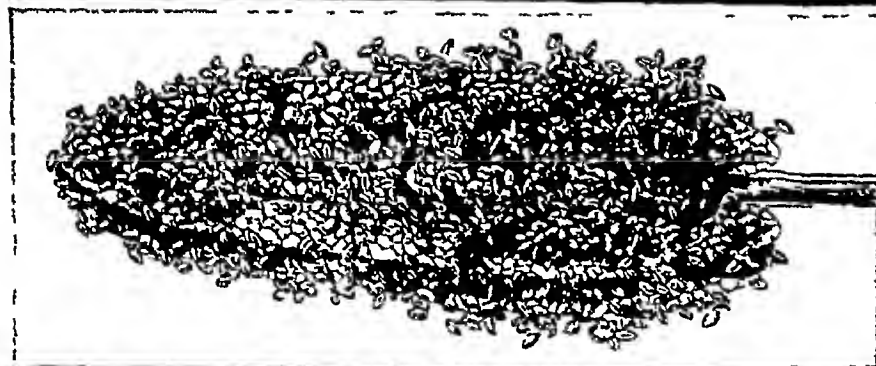
## FLOWERS



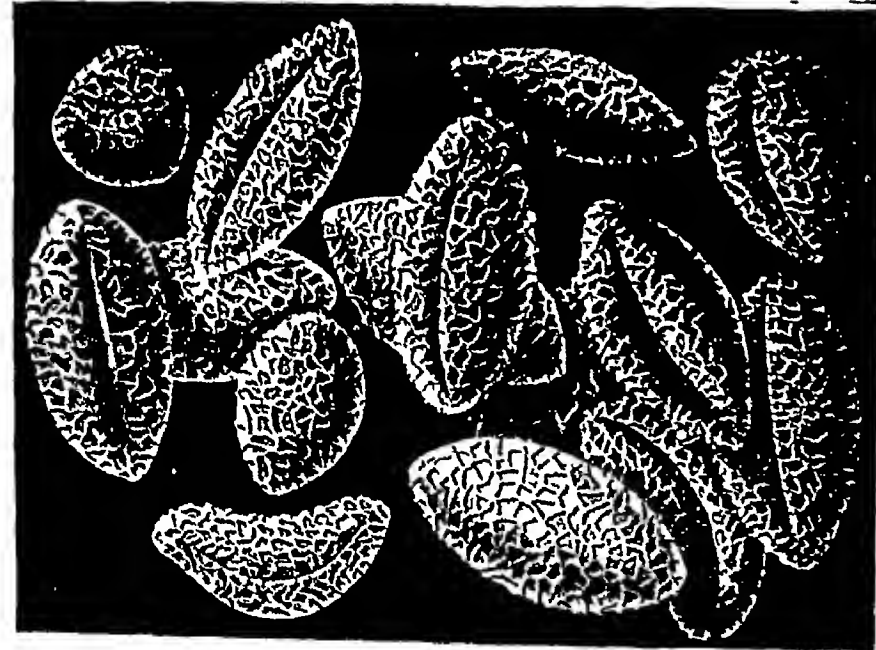
9 Let us look at the anthers under a microscope, while the walls of this workshop stand secure. For they are about to fall, pushed outward by the growing strength within them. Notice what a delicate structure it has.



10 Sheltered from all harm are the wonderful grains, seen clearly in this cut across the anther, growing in power and building up the force that is soon to make itself known to us. Owing to the risk pollen grains run of being lost in their business of getting from one flower to another, Mother Nature sees to it that a great many more pollen grains are produced than are really needed.



11 Now the grains have burst their bonds, and the anther is yellow with pollen. Like a magician's wand it is, for a touch of this pollen brings a new flower into the world. All that's needed is a breath of wind or the passage of a travelling insect to transport the golden dust, and the miracle is accomplished.



12 We see the pollen grains closely here, greatly magnified. Marvellously are they made, with rough coats by which they will cling to the hairy body of the bee when it comes. Another thing that enables the pollen grains to fly with the wings of friendly insects is that in many cases they have a sticky substance over their whole surface, and this and their variously shaped grooves make them cling together, so that insects carry away large masses of the grains in going from flower to flower. This tends to make the process of fertilization more certain.

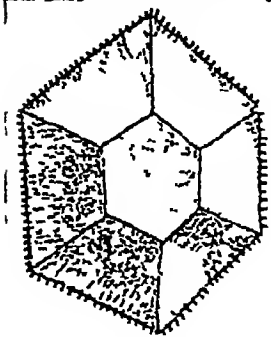
## FLOWERS



Passion Flower



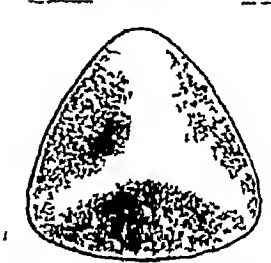
Willow-Herb



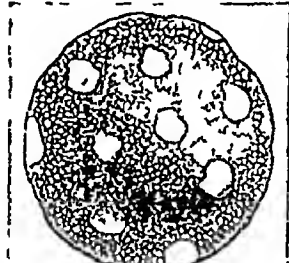
Dandelion



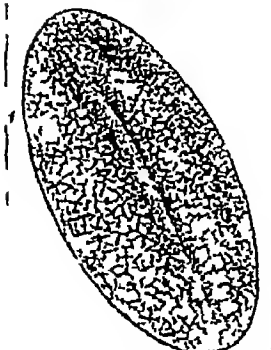
Marguerite



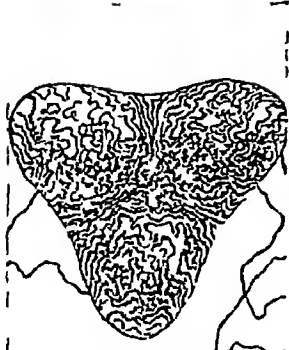
Nasturtium



Phlox



Tiger-Lily

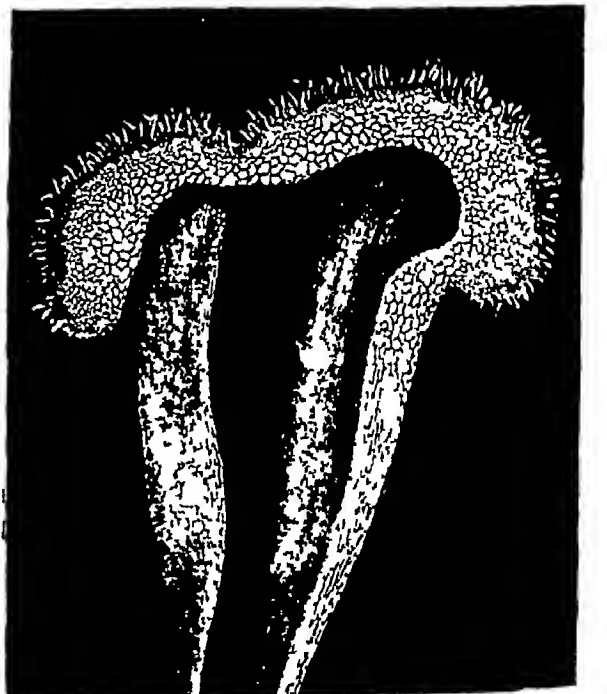


Rhododendron

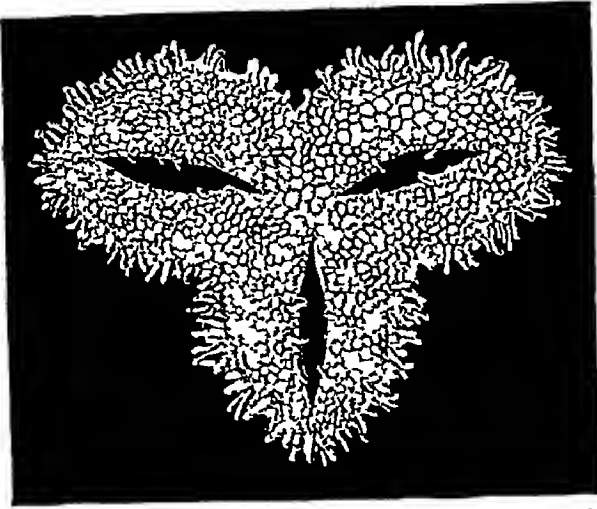
13 How immeasurable and unthinkable are the powers of Nature! No two flower-seeds are quite the same, neither are their pollen-grains. Nature has patterns enough and to spare, and she makes nothing, we must believe, without care and purpose. These few pollen-grains have been photographed under the microscope, and we see how beautifully they are made, though we cannot tell why this should be this and why that should be that. It is part of the great mystery that Life will one day reveal to its children.



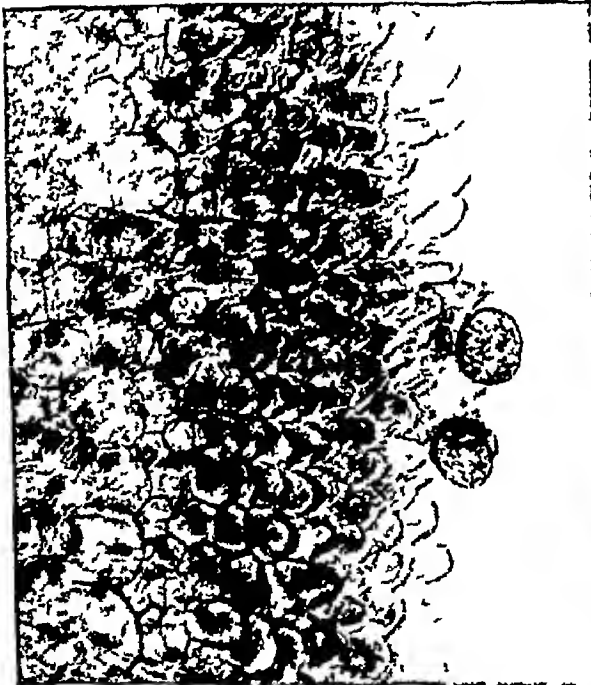
14 Let us look now at the stigma, and look closely at the top of it. We see how easily a grain of pollen may lodge in this rough place held by these rough sticky points which the microscope so clearly shows. Here the grain lies and waits until the moment comes for the great work it is to do.



15 And now we cut right through the stigma downwards until it looks like this. We see its delicate structure, how beautifully it is made, but, more important still, we see a hollow passage down the style. It is an astonishing thing that travels down this passage to the home of life below.



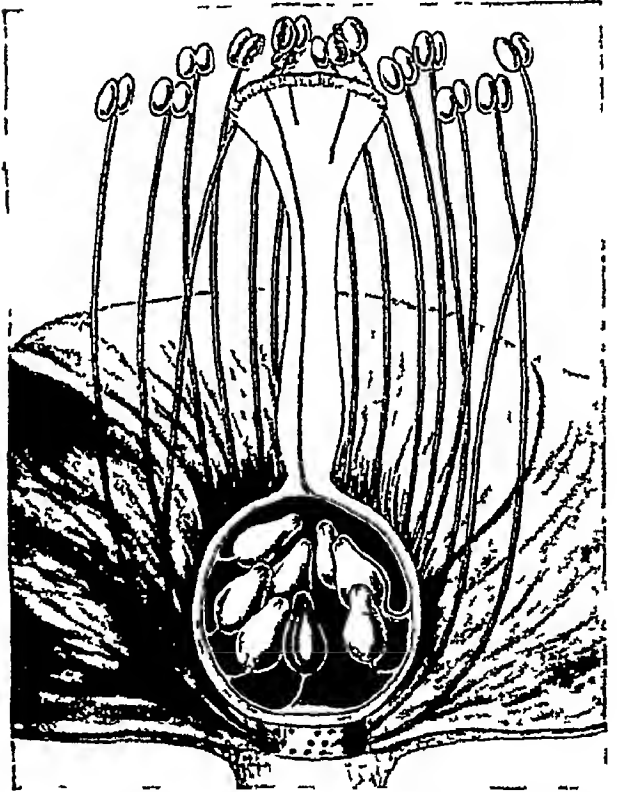
16 There are three of these narrow ways through which there comes to the heart of the flower the messenger of Life Through each of the three heads of the stigma this hollow passage runs, until the three join in the style and run as one to the ovary below Here we have cut a slice across the stigma showing the three ways leading to the ovary These passageways, as we shall see, are the portals which lead to new flower lives It is through them that the pollen tubes will travel on their errand of creation



17 Now comes the bee this way, fresh from another flower, laden with its sweet and golden stores, and covered thick with pollen-dust It must brush past the stigma on its way to the nectar, and it leaves on the stigma tiny grains of pollen from another flower Here we see them as they lie on the surface of the stigma ready for the great work before them



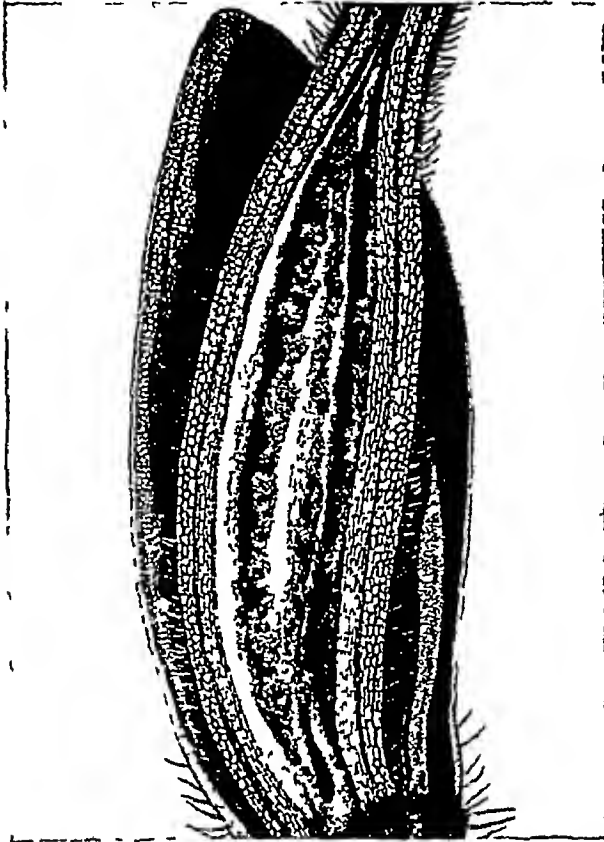
18 And now is the wonder of wonders The pollen specks make their way down through the stigma till they reach the hollow space They swell up and each one sends out a wonderful tube It shoots out and passes down the narrow space until it has reached the ovary, the place where the seed of life is hidden



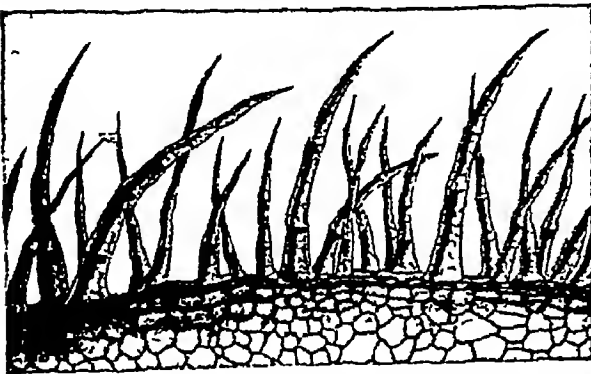
19 This is the place where a flower is born In this sheltered chamber are colonies of little green things called ovules, clinging with tiny stems to the walls They lie here waiting for the messenger who comes from the outside world Soon the pollen-tube arrives, making its way through the wall of the ovary and pushing on until it touches a little green ovule If the tube does not touch it the ovule must die, but at the touch of the pollen-tube it grows into life, becomes a seed, and will become a flower

## FLOWERS

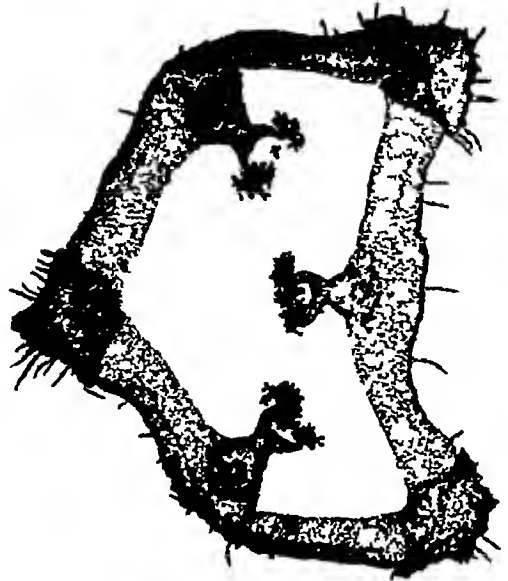
A new life has been born into the world, the wand of Nature's wizard has penetrated her hidden ways and wrought a miracle there, and we have passed by, perhaps unheeding and unthinking



20 Now we will peep into the ovary itself, cutting through it downwards. It happens that we have taken the lady's slipper, a distant cousin of the lily, for this picture. The little white specks on the ridge in the heart of it are the ovules. Marvellously sheltered is this inner chamber where a flower is born, yet the gold dust the bee has brought from far away throws out its tubes and pushes down with its quickening touch until, from this hidden place, there comes out into the world the beginning of another flower.



21 Let us notice the little hairs that protect the outside walls of the ovary. Here we see a few of them greatly magnified, and we can realize how powerful they are to serve their great purpose.



22 We have cut through the ovary downwards, now we see it cut across. The little ovules are clustered on the three little ridges.



23 Now we turn the microscope onto one of the three ridges and see the ovules nearer and nearer. Each little group of specks makes up an ovule.



24 It grows into a seed like this. Even here, in this highly magnified photograph of a seed, the eye sees almost nothing, yet this tiny thing, after the coming of a pollen-grain, has in it the power to reproduce the plant in which it grew. It is the cradle in which the beauty of the earth lies asleep.

**Fly.** The common house fly, *Musca domestica*, which is found wherever Man dwells, is one of the most dangerous of all creatures

Catch a fly and look at it through a magnifying glass. You will see almost all over the legs and body a mass of hairs, and will note that the greedy tongue is spread over with sticky glue. If you could look through a powerful microscope, you would probably find that on those hairs and mixed up with that glue are deadly bacteria—perhaps germs of typhoid fever, tuberculosis, dysentery and a score of other diseases, for this "harmless insect" has probably just visited some infected dust bin or refuse heap.

The time to kill flies is in the early spring before the breeding season has begun, for the number of flies is not so much regulated by the number of grown specimens that escape the "fly swatter" as by the number of suitable spots the female fly can find in which to lay her eggs. She will lay them in any filth, and if necessary she will use a dust-bin, a drain, or any other suitable place. So, if you would put down flies, do not let them breed, kill them in the early spring. If people would not allow refuse to collect there would be far fewer flies.

Let us trace the short life of a house fly. Each year a certain number of flies—or, more probably, their larvae—live through the winter. As soon as the warm weather appears, the larvae finish their growing up, become adult flies, and commence breeding. The warmer the weather, the quicker this happens.

In one day the first batch of about 150 eggs may have hatched into small white larvae or maggots. After about five days each maggot

goes into the pupa stage, in which the baby fly is wrapped in a tough protecting shell. About five days later a full-grown fly emerges from each chrysalis. Usually, however, the time taken is a bit longer than this, but it may be less.

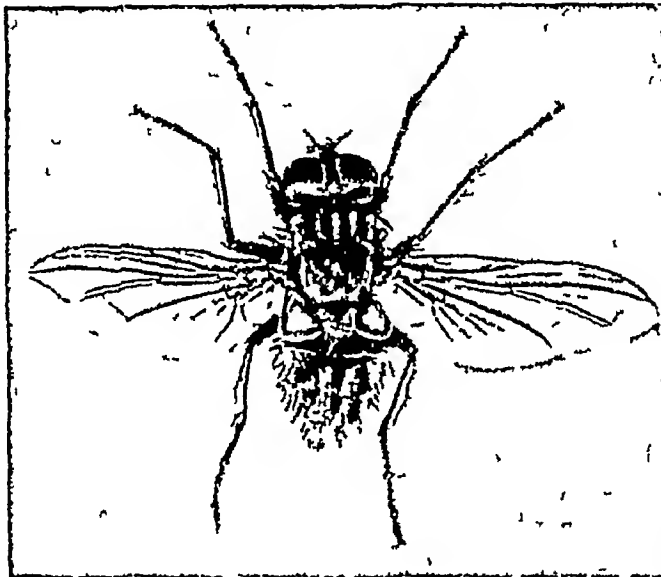
It has been computed that between April and September one female house fly might have 5,598,720,000,000 descendants if all her female offspring lived and started laying eggs in due season. Of course they do not all live and lay eggs, but sufficient numbers survive to make the human death rate from typhoid fever about five times as great during the summer fly season as it is during the winter months, when the flies are not active.

Killing one fly in April, therefore, is as good as killing millions of flies in August. If the successive generations of females could find no places to breed, it is easy to see that flies

would simply cease to exist, and when flies cease to exist typhoid fever, dysentery and certain other diseases which particularly attack young babies will be greatly lessened.

Besides the house fly there are many other members of the same order, *Diptera*, very different from this unwelcome guest of our households. The mosquitoes, gnats, midges and daddy long-legs all belong to it.

There are some kinds of flies, though, that are the good friends of Man instead of his enemies. Some of these destroy harmful species and so help to keep their numbers down, such as the robber-flies (*Asilidae*), which swoop down on other insects with murderous greed, and the hover flies (*Syrphidae*), those quaint insects which seem to stand still in mid air. Their larvae eat the "greenfly" of our gardens. Other flies are parasites.



THIS IS THE FLY TO SWAT!

The house-fly (top magnified five times) is one of Man's most dangerous enemies, spreading disease wherever it goes. Its long tongue, with a sucking disk at the tip, projects from the bottom of the head (bottom left) and on the feet (bottom right) there are other disks by which the fly clings to the ceiling.

Photos J. J. Ward H. Baetlin





F. Jefferson

### HANDSOME PIED FLY-CATCHER

Sitting outside the hole in which is his nest, this cock pied fly-catcher is one of the handsomest little birds you will find in Britain. It is easy to see why he is called "pied" but his mate is not nearly so brightly hued.

**Fly-catcher.** These birds, as their name implies, feed on flies, and they also take countless other insects, such as grasshoppers, weevils, moths and caterpillars. Fly-catchers of the Old World belong to the family *Muscicapidae*. The male pied fly-catcher, *Muscicapa atricapilla*, is black and white, the female grey and white. It breeds in the north and west of England and in Wales. It nests in holes, and the eggs are of a pale greenish blue. The spotted fly catcher, *Muscicapa griseola*, which seldom arrives until late in May, is more common, especially in the south. It is grey and brown, nesting in ivy and in cracks in walls, etc. The eggs are greyish with brown markings.

**Flying-fish.** A "fish out of water" is not always the helpless flopping creature which has given us this common expression for the "man out of his element." Indeed, few things are more beautiful than the sight, so frequent in warm seas, of a company of silvery fish rising suddenly out of the waves under the steamer's bow and darting through the air like huge dragon-flies.

Flying-fish, of which there are about sixty-five species, are still something of a puzzle. Even scientists are unable to agree as to their method of flight, some asserting that the fish propel themselves by their big front fins, others saying that these fins act only as flying planes, and that it is the speed with which the fish shoot

out of the water that carries them along. The smaller flying-fish of the Atlantic Ocean cover short distances only, but the larger species, found in sub-tropical and tropical waters, often travel two hundred yards. Their outstretched fins measure nine or more inches across.

All flying-fish use their power of flight to escape from their many enemies, chief of which are surface feeders such as the tunny, bonito, dolphin and shark. Often they fall on the decks of ships, especially at nightfall, when apparently they are attracted by the cabin lights. Most varieties are excellent food, but somewhat dry to the palate.

**Flying-fox.** This animal is really a bat, although it is considerably larger than the common bat, which it very much resembles in its habits, except that it feeds on fruit.

It is found in Asia, and the largest species, *Pteropus edulis*, which has a wing span of about 5 feet, is an inhabitant of Malaya.

**Flying-squirrel.** This interesting sort of squirrel does not actually fly, but makes parachuting leaps from tree to tree. Connecting the fore and hind legs there is a peculiar skin extension, which spreads out to form the parachute. In other habits it resembles ordinary squirrels. This type is distributed from Europe, across Asia, to America. A second type is African, and less closely related to the true squirrels.

**Foch, MARSHAL FERDINAND** (Pron fosh) (1851-1929). "Outflanked on the right, outflanked on the left. Situation on the whole excellent. Am going to advance." This was General Foch's brief message to General Joffre at the critical battle of the Marne early in September 1914. And advance he did, a fact that in large part accounted for the glorious Allied victory and for the saving of Paris from German occupation. General Foch was for years professor of military strategy, and later director of the Ecole Supérieure de Guerre, or Staff College, and his books on the art of war were famous throughout Europe. He believed firmly that the only way to win battles was sooner or later to take the offensive and advance.



### THE FLYING SORT OF SQUIRREL

Between his legs, this little squirrel has a thick membrane whose edge you can see in this picture. When he wants to go from tree to tree he spreads his legs and parachutes across on this extension of his skin. He is found in North America.

Photo H. S. Herridge



against the enemy "To make war," said he, "is to attack" But this did not prevent him in practice from being extremely careful not to be led into rash advances

After the Allies had made a tremendous but unsuccessful attempt to drive the Germans out of France in May, 1917, Foch was made Chief of Staff of the French Army At this time the hopes of the Allies were low They were even lower in March, 1918, when the Germans began their big advance in the West Indeed, it looked for a time as if they might smash their way through Amiens to the English Channel But the spirit of Foch prevailed He simply refused to admit that he was beaten "Before Amiens, in Amiens, and behind Amiens, I will go on fighting," he declared On March 26 Foch was made Commander in Chief of the entire Allied army on the Western Front, and presently the advance of the Germans was stopped

#### From Victory to Victory

Then, on July 18, Foch began the great Allied offensive, which never ceased until victory was won "We have begun and we shall continue," he declared First at one place and then another, the French, British, and American armies under his direction hurled the Germans back until they were driven out of France

Then came the armistice of November 11, 1918 On the following day Foch addressed his victorious troops as follows "You have won the greatest battle in history, and saved the most sacred cause—the liberty of the world Well may you be proud With immortal glory you have adorned your banners Posterity cherishes for you its gratitude"

Made Marshal of France in August, 1918, and later a British Field-marshal, he was chief military adviser to the delegates of the Peace Conference at Paris, and as such had much to do with the framing of the Treaty of Versailles His implacable hatred of Germany and his territorial ambitions for France led him to urge the establishment of a French frontier on the Rhine He died on October 20, 1929

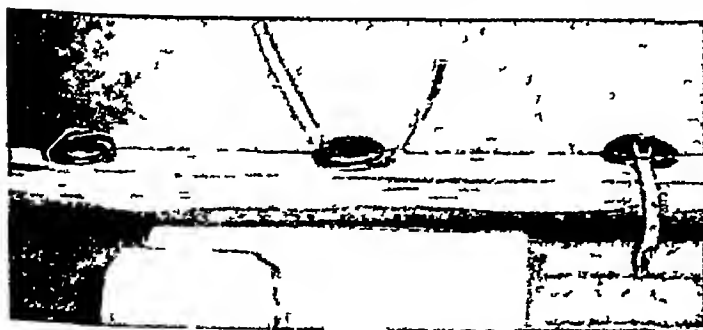


**MARSHAL FOCH**

The French general who led the Allies to victory against the Central Powers in the World War had all the qualities of a great soldier—indomitable resolution, coolness in moments of crisis, and complete confidence in himself and his troops  
*Imperial War Museum*

**Fog.** Dew and fog are much alike, and both are forms of water Dew is moisture which forms on vegetation, while fog forms in the air on particles of dust "But," you may say, "there is no dust in ocean air, it is clean" Even clean air, however, has some dust in it, and on these tiny dust particles the moisture condenses when ever the temperature is lowered

There are several ways in which the temperature of a layer of air is lowered Warm moist air blowing over a cold surface is cooled and must squeeze out some of its water vapour The fogs off the coast of Newfoundland are due to the fact that the air from warmer parts of the ocean blows over the icy Labrador current, becomes chilled, and so condenses its moisture Wind or rising temperature clears away fogs It is for this reason that fogs usually disappear as the day advances The most remarkable fogs are those that form over great cities At times the fog is so dense as seriously to impede traffic,



**RAILWAY FOG SIGNALS**

A fog signal is a round 'cap' containing an explosive which is detonated by the wheels of a locomotive passing over the rail to which it is fixed. Above you see, left, the cap as it is stored with flanges folded, centre, with flanges open, and, right, attached to the rail.

visibility extending to only a few yards. The reasons for London's "pea-soup" fogs are not hard to find. The prevailing winds are moisture laden since they blow in from the Atlantic. In winter they meet cooler currents over the land, and mingle with the large amount of dust and chimney-smoke floating about over the great city. Fog forms more easily there than in cleaner air, and once formed is less apt to clear away. The fog particles become coated with an oily substance and, therefore, evaporate less readily than over the ocean. The more smoke that rises from a city, the thicker and more frequent its fogs become. Fog is the greatest of all dangers to shipping and aircraft, and serious dislocation of rail traffic is averted only by extensive use of safety devices and fog signals.

**Folklore.** The traditional tales, songs and dances which make up a country's folklore are the Topsyies of the literary and musical world. They have no father and mother, but like Topsy they "jes' grewed."

In times long ago, when the day's work was done, the older folk would tell the younger generations the weird tales of gods and men, of ghosts and fairies and animals, which they themselves had heard their fathers tell. They sang the stirring songs of battle and mournful ballads which had been handed down from a past

so remote that no one can be sure when it began, and mothers crooned their babies to sleep with lullabies almost as old as the human race.

When the harvest had been gathered in, or when the magic fingers of spring were awakening the flowers from their winter sleep, or at other times of festival and ceremonial observance, groups of young men and maidens danced the strange old dances that others before them had danced for untold centuries. Even today these ancient tales, songs and dances still live.

Little did the unschooled people of early days think that scholars would one day search out and study their simple lore. But that is being done today by students and societies in many lands.

The first to make a serious study of folklore were the brothers Wilhelm and Jakob Grimm, two gentle German scholars who lived about 100 years ago. Their names are as familiar now to children as to men of learning, for among the tales which they collected from the peasants of Germany are the stories of "Lucky Hans," "Hansel and Gretel," "Princess Snow White" and many other favourites with children of today. In a similar way we received our own "Mother Goose" rhymes, from France the stories of "Puss in Boots," "Little Red Riding Hood" and "Cinderella", from the American negro the stories of "Brer Rabbit and Brer



A SWEDISH FOLK-DANCE THAT IS FULL OF MEANING

In the Swedish weaving dance seen here, the couples advance and retreat several times in imitation of the beating movements made to separate the flax fibre from the straw, the old time spinning is expressed by the whirling, skipping and clapping, then backwards and forwards again for the shuttle movement of the weaving, over and under for the bobbin movement and, finally skipping away to imitate the rolling of the finished cloth into a bale.

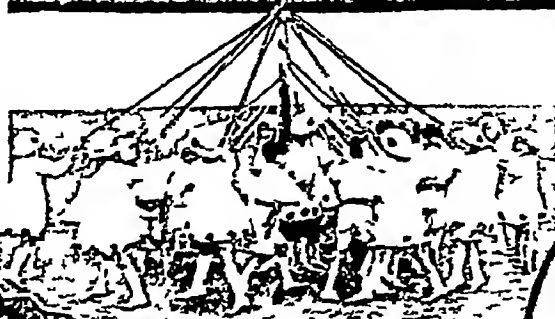
# CHILDREN FOLK-DANCING ROUND THE WORLD



Wooden shoes clatter as the Dutch lad and lass above hop and circle in a coquettish dance beside the peaceful Zuider Zee



Figures on old Greek vases show the same graceful postures these dainty maids at the left employ as they frolic on the grass in natural movements of dances that originated in dim far-off times



English children wind bright ribbons about a Maypole in their May Day fêtes



Tambourines jingle, fingers snap and bright skirts twirl as the gay Italian girls above romp in their swift, vivid dances. Best known of these is the Tarantella named after the city of Taranto. Folk-lore says that dancing it to exhaustion will cure the bite of the deadly tarantula.



These four Welsh girls link arms as they dance to an ancient tune



The bright-eyed Montenegrin pair above leap and twirl in one of the many fiery dances that have been popular in the Slavic countries of the Balkans for untold centuries

At the left a barefoot maid of India dances before the gods in her temple. The elaborate ritual of such dances is an expression of the ecstasy and mysticism that mark the oriental religions

Normandy's dances are light and airy, like the flutter of its apple blooms



Look below at these almond-eyed tots in brilliant kimonos shuttling tiny sandalled feet in a festival fan dance. A Japanese myth relates that dancing once brought back the lost light of the sun



At the right two youngsters in the heavily embroidered peasant costumes of the Ukraine are pictured in a figure of the dashing "Kozak" so popular among the border folk of southern Russia. The folk-dances of Russia are remarkable for their speed and vigour



Fox," and from many other lands and peoples tales which now belong to the children of all the countries of the world

So, too, men have searched out and written down the old songs of all nations—the songs of seed-time and harvest, of winter and summer, nursery songs, love songs, marriage songs, funeral songs, war songs. Nothing tells us more surely the sort of life a people live than their songs. Take the beautiful folksongs of Russia, for example. In their sad minor melodies and strange wild rhythms they give us, even without the words, a picture of a life so grim and sad that its only relief was in noisy gaiety that still felt the touch of hopelessness.

The folksongs of Switzerland tell us of mountains and valleys, in their melodies we hear the shepherds' pipes and the "yodel" of the Alpine dwellers. The folksongs of Scandinavia suggest something of the surging of the ocean in their steady rhythm, and through them creeps the plaintive murmur of the waves. The folksongs of the British Isles reflect the different characteristics of the people of England, Scotland and Ireland.

Have you heard the old French song, "On the Bridge of Avignon"? This was sung by the girls and boys of France more than 400 years ago. It tells how the people of all classes passed over the same bridge in the same way—lords and ladies, clerks and soldiers, pipers and street urchins. So it gives us a picture of France in those early days. In the same way the song "Jenny Jones" gives us a good description of customs and costumes in early England—with its washing and folding and starching and ironing, and its sickness and death portrayed in the stanza

Jenny is dead, dead, dead,  
Jenny is dead, you can't see her now

Folksongs are the natural unstudied expression of the common people, they are the laughter and the tears of those who, hundreds of years ago, lived and loved as we do now. The songs of the common people were not made by rule. They sang as the lark or nightingale sings, and their art was so simple and free from effort that it still gives us pleasure, much as when we hear a wild bird sing.

Folk dances are the twins of folksongs. Where you find one you find the other, and often they even claim the same tune. Many folk-dances tell stories just as the songs do. Did you ever see the Swedish weaving dance? It tells you the story of the primitive flax harvest and the making of the linen. The rows of dancers advance and retreat, advance and retreat, in imitation of the beating used to separate the flax fibre from the straw. They whirl and skip and clap, and we get a glimpse of the old time spinning, and then the couples go to and fro in the shuttle movement of the weaving, and dance through the difficult over and under of the bobbin movement. Then comes the rolling of the finished cloth into the bolt, and the happy workers skip to their homes.

Equally familiar is the sailors' hornpipe, with its hauling the anchor, hoisting sail, paying the slack, and wild heel and-toe at the sight of land.

Nearly every nation has its own distinctive dances, such as the picturesque Scotch reel, the jolly Irish jig, the furious Italian tarantella, the stately Spanish saraband and the lively Polish mazurka. (See Dancing)

**Foochow, CHINA.** In Chinese, Foochow means "the Happy City," and the traveller who steams up the Min River to this seaport, facing the northern extremity of the island of Formosa, easily understands why the beauty



**FOOCHOW'S PICTURESQUE BRIDGE**

The Chinese port of Foochow stands on the river Min, which is spanned by the curious bridge seen in the photograph. It is called the Bridge of Ten Thousand Ages, and is a remarkable example of Chinese engineering. Beyond the bridge can be seen a forest of masts of the junks which carry the river and coastal trade of this busy port.

loving Chinese gave it this poetical name. Entering the river through the Haitan Straits, the steamer for 34 miles threads its way between islands and mountains towering several thousands of feet on each side of the river.

When the city comes into view it presents a sight unique among Chinese cities, with its encircling walls, lofty wooded hills and tall pagodas. The walled city lies two miles away from the river, but the space in between is filled with a busy commercial suburb, for Foochow is the capital of Fukien province and one of China's principal seaports. From the fact that wide spreading banyan (fig) trees have taken root in the crevices of the grass covered brick walls, Foochow is also called by the Chinese "the Banyan City." Two of the pagodas are more than a thousand years old.

One of the chief glories of Foochow is "the Bridge of Ten Thousand Ages." Rebuilt in

1931, after 800 years, it is a roadway 1,350 feet long, built of enormous slabs of grey granite, some of them 45 feet in length, resting on piers of huge granite blocks so enormous that one wonders how they could ever have been brought from the mountain quarries. High stone parapets protect the throngs who are for ever passing or stopping to crowd about the stalls on which food and cheap trinkets are displayed. As busy a tide of life flows beneath the bridge as on it, for half the population lives on the river in junks and sampans.

Foochow is one of the treaty ports of China opened to foreign trade in 1842, and today it is a prosperous port with shipbuilding yards, a dry dock and numerous wharves. In the days of the "tea clippers" (see Ships), when ships raced home to London with the first of the season's China teas, Foochow was the chief "departure" port. Population, about 320,000.

## FUEL for the HUMAN MACHINE

*No machines can go without fuel, and the human body—the most wonderful machine of all—is no exception. Here we read of what our fuel is composed of, and how it makes our "wheels go round."*

**Food.** It is only within recent years that food—its quality and freshness, its suitability, its values in terms of calories, mineral salts and vitamins, in health and disease, in infancy, adolescence and adulthood, and its influence on racial characteristics—has been studied as a subject worthy of a defined place in the science of physiology. Today this specialized branch is known either as Nutritional Science or as Dietetics, and to its advancement are

devoted the energies not only of individual scientists, but also of Governments. Indeed a Committee of the League of Nations, under the presidency of Lord Astor, considered this subject unremittingly for over two and a half years.

Quality not quantity is the keynote of this new science, and vast changes in the eating habits of nations have proved (and have been confirmed by official national statistics of mortality and disease) that the way to sound health is indicated clearly by the proper use of varied foodstuffs suitable to age, climate and activity. For this conception of the human needs in regard to foodstuffs the phrase "balanced dietary" has been most aptly coined.

Let us look into the past for a moment to note all its implications. When primitive men

were hungry they ate wild berries, nuts, fruits, seeds, and roots, they devoured the raw flesh of small animals and shell fish, for it took them a long time to learn how to make weapons of stone and wood with which to kill or snare larger animals and the swift-moving fishes. In those early days life was either "a feast or



**FOOD OF EARLY MAN**

In a cave at Chou Kou Tien, south-west of Peking, this thick layer of shells of hackberry seeds was found, most probably carried there by its early inhabitants for food. This may have been 150,000 years ago!

Carnegie Institution Washington



"famine", they gorged after a lucky hunt, and they starved when frost nipped the fruits and the grains. The same thing happens today among the primitive peoples of the world, and, on a smaller scale, it is not unknown among the weekly wage earners of civilized countries, who spend the greater part of their earnings in the first part of the week and go short in essential foodstuffs for the rest of the week.

In the light of modern knowledge we now know this system to be entirely wrong and fruitful of disease. Food must be considered in terms of the person (or machine, for it is the same thing) that is going to consume it and the work that person has to perform. If we will only remember that the body requires just sufficient food to provide heat and energy for its muscular and mental activities, for growth and for weight, for repair of waste tissues, and for the provision of a suitable margin for individual tastes and tolerance, and for health maintenance, we shall the more readily perceive the dangers that attend gorging or fasting. Anything beyond these requirements is worse than superfluous, likewise, deficiency of essential foods taxes the reserves of the system, depleting nerve muscle, blood, liver and other organs of fuel essential to their proper functioning. To diets of these kinds, too rich in every part, or rich in one or more at the expense of others, or poor or inadequate in all or some of the essential foods factors, we give the name "imbalanced" diets.

It is clear, therefore, that the body must suffer from periodic imbalance of total food eaten, and it was human experience of the resultant defects that prescribed regular meals and food quantities for every day. Medical science long ago endorsed what experience teaches.

But though imbalance of quantity became regulated it was not until the beginning of this century that imbalance of quality came to be recognized as the true cause of malnutrition. The investigations of physiologists showed that whole nations, otherwise provided with plenty of foodstuffs, suffered from diseases like beri beri, rickets and pellagra, from which other nations, less liberally endowed with bulk foods, were



#### PLANTS THAT GIVE FOOD AND DRINK

Here are some of the plants that give us familiar foodstuffs  
 1, Wheat ripe ear, flower spike, and foliage 2, Oats  
 3, Barley flower spike, ripe ear and leaves 4, Maize plant and ripe cob 5, Rice plant and ripe head 6, Tea  
 7, Hops 8, Vanilla flower and pod 9, Sugar cane.  
 10, Coffee 11, Cacao (cocoa)

immune. Research brought to light the value of the mineral elements, the amino acids and vitamins in Man's dietary, and proved that energy value alone was insufficient for the maintenance of health and stamina. Among the pioneers of the new science of nutrition are Sir F. Gowland Hopkins, Professors McCollum and Edward Mellanby and Sir J. B. Orr.

A human being requires not a protein or a carbohydrate food, but foods that will give him a variety of proteins and their essential varieties, a mixed dietary that will provide him with different sugar and starches of different origins, an everyday diet that will give him organic lime, iron, phosphorus, chlorine, magnesium, sulphur and the other minerals for which his system craves, as well as purveying those accessory food factors known as vitamins.



## FOOD

A, B, C, D, E and G, whose influence on the assimilation and structural utilization of other and grosser foodstuffs has been proved essential to healthy development

Thus we see that foodstuffs have come to be divided into two categories, those foods which produce energy and heat, and those which maintain normal growth, weight increase, health and stamina. There is no watertight division between them, but for convenience some foods are labelled "protective foodstuffs," because, besides being energy producers or flesh-formers they contain the essential minerals and vitamins

### Guardians against Disease

Chief of these foodstuffs are fresh milk, butter, cheese, eggs, home-fed meat and poultry, fresh-caught fish and home grown fruit and vegetables. You will see that these are "natural" foods, that stress is laid on "freshness" and that home grown foods, wherever possible, are to be preferred to imported. Unless an adequate amount of these protective foodstuffs is taken daily and all the year round, it is virtually impossible to maintain full physical activity, and consequently health, at a maximum

If we look back in history we find there the practical proof of balanced dietary. It teaches us that those people who have developed the healthiest bodies, the keenest minds and the greatest civilizations have been able to get a food supply that contains a sufficient amount of all the elements the body demands. In the Arctic regions this balance is lacking. The primitive Eskimos live almost wholly on fats and proteins, and their bodies crave the carbohydrates we so easily get in fruits and sweets. Since constant hunger keeps them hunting food in their barren land, they have contributed little or nothing to civilization. And, in the tropics, where Nature furnishes an abundant supply of carbohydrates, the natives have failed to develop great civilizations, for they become indolent and will not exert themselves to get the complete foods their bodies need—the extra proteins for body building

In the wet monsoon regions rich crops of rice support life

for vast populations. China can provide a wide variety of food, but as yet has not developed its great resources. Even today there is comparatively little poultry and cattle raising. The Chinese secure some protein from fish and beans, but lack the acids and the minerals of fruit, which they consider a great luxury. Rice is the great staple crop, and, apart from the health aspects, this lack of variety in diet has two disadvantages: it is monotonous and workers get no pleasure out of it, and if the rice crop fails the nation starves because no alternative food is available

Since people can best secure a balanced diet in the subtropics and in the southern part of the North Temperate zone, we should expect the first great civilizations to develop in those regions, and it is true that they did—in Egypt and Mesopotamia

Most of the food plants we know had their origin in the alkaline soil of central Asia or in

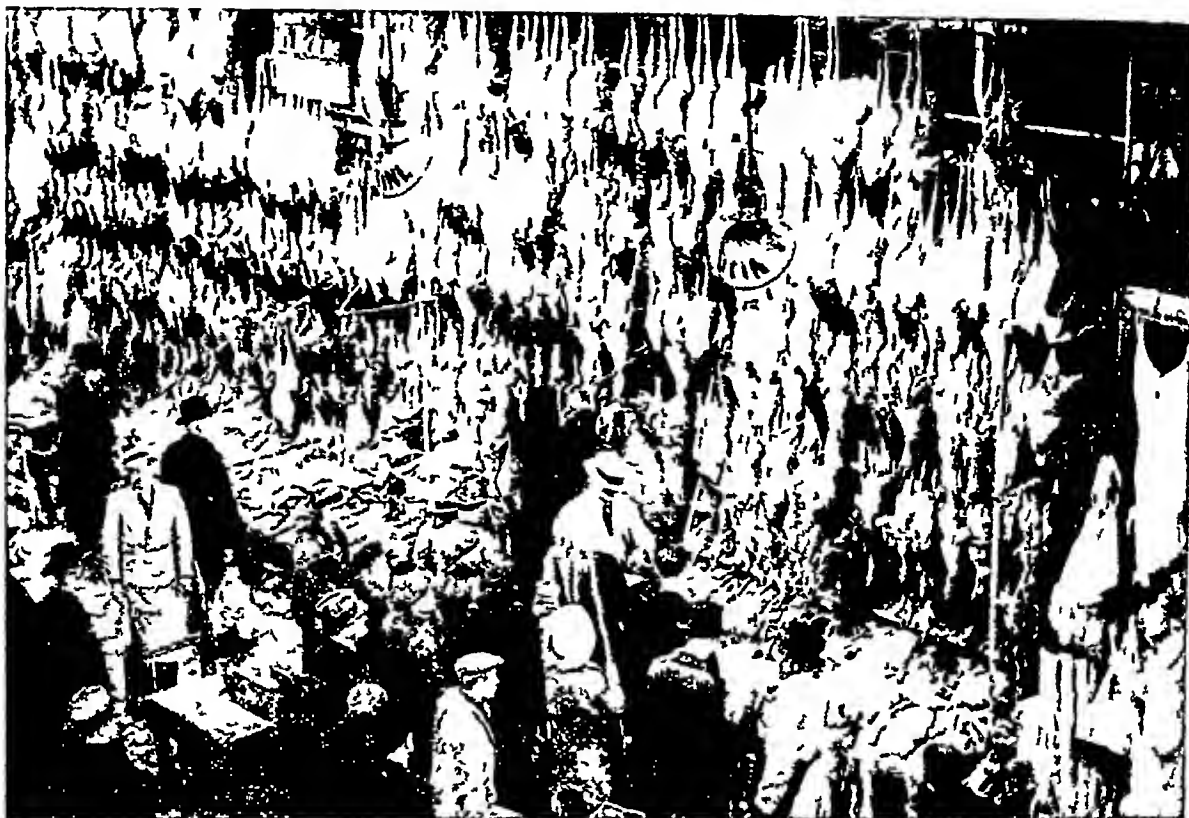


### AN EASTERN FOOD PLANT IN GROWTH

This scene shows natives in Ceylon drawing their wooden, ox-driven ploughs through the terraced rice-fields. Notice how important a part water plays in rice cultivation, the fields have to be literally sodden. Rice can be used to supplement any diet, but should not be—as it often is in the East—the sole food

Photo W. I. Taylor

# MEAT & FISH MARKETS FOR LONDON'S MILLIONS

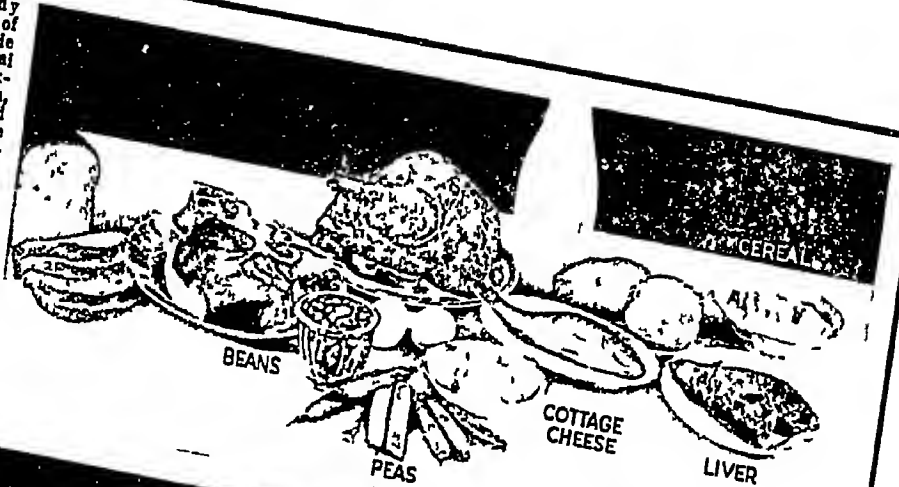


London's inhabitants are supplied with meat and fish from several famous markets, including those of Leadenhall and Billingsgate. Meat and poultry are dealt with at Leadenhall Market, and here you may see carcasses of meat, or, as shown in the top photograph, hundreds of heads of poultry awaiting distribution. The lower photograph shows a street beside Billingsgate Market alongside the Thames just below London Bridge. The position of the market is due to the fact that London's fish originally came by water, though it is now brought to the capital by train packed in wood boxes.

Top Keystone lower Topical

# FOOD

**Proteins Body Builders**—Some of the most valuable sources of animal proteins are chicken, beefsteak, fish, eggs, liver, and cheese. Among the foods rich in vegetable proteins are whole-wheat bread, beans, peas, potatoes, and whole-grain cereals. Animal and vegetable proteins are not exactly alike, and our bodies need some of each. Animal proteins are more easily digested than the vegetable proteins.



**Carbohydrates Energy Makers**—Jelly, bread, carrots, spinach, bananas, oranges, apples, prunes, cereal (with sugar and cream), baked beans, syrup, potatoes, maize or Indian corn, tomatoes, figs, and ice cream are all good sources of carbohydrates. These food elements are turned into energy by our digestive systems. Many of the carbohydrate foods also give us the roughage we need.

**Fats Heat and Energy Makers**—This picture shows some of the foods that contain fats, and some of the ways in which we blend them with other foods for the fat. Butter, lard, cream, olive oil, and other vegetable oils are among the commonest fats in our diet. Milk contains fat as well as other food elements. Bacon and steak provide both fats and proteins. Ice cream is a good fuel food.



**Minerals Bone, Teeth, and Muscle Builders, and Body Regulators**—These foods supply generous amounts of the minerals which help to build our bones, muscles, and teeth and give us red blood. Milk is the best source of calcium and contains almost all of the other minerals we need. Iron, iodine, and phosphorus are among the minerals supplied by the other foods. Many foods on this page are rich in vitamins.



## FOOD

the Mediterranean basin, and the most prosperous and active communities have grown up on soils of this kind

The fertile valleys of Greece supplied its population with the principal foodstuffs—wheat, fruit and oil—until the 8th or 7th century B C, when there were too many to be fed by crops from the narrow rocky land

As the world has grown in culture and as men have learned to find its wealth, they have improved both their standards of living and their diet. Cooking has made today's meals much more appetizing than the meals of primitive men. Spices from the East played a great part in ancient and medieval cookery, for they preserved foods and covered the flavour of staleness before refrigeration was discovered. Since the Middle Ages commercial nations have fought for this rich trade, which was held in turn by Phoenicians, Arabs, Portuguese, Dutch and English.

As the nations of the world have prospered and their populations have increased, they have looked for new territory to raise food to fill their growing needs and to provide homes for their colonists. Spain sent Columbus across an uncharted ocean to find another route to the eastern spice countries, then it attempted to spread a vast empire in the New World. England, too, made the northern section of this new land a part of its far-flung empire. Since then, North America has been a haven for people from other over-populated nations. It offered not only rich acres but also new food plants that have improved the world's diet—potatoes, tomatoes, maize, peanuts, cacao, new types of beans, and fruits. Its spreading acres have multiplied the world's supply.

### When Everyone Grew His Own Food

But before the days of modern farming machinery the production of food was a laborious process, and the whole family was forced to work long hours on the farm to reap the harvest. Each farmer produced most of his own food and fodder, and he made most of the other things he used besides—his few tools, home spun cloth and his furniture. The slight surplus that he did produce was carted to the nearest town over rough roads and there sold in the market-place.

In the 19th century power machinery was invented, and with this advance the whole problem of food supply was changed. Agricultural machinery revolutionized farming methods, it brought about mass production and specialization. The quantity of food which one man could produce was many times as great as before. With the new methods of farming, and engineering works that drained marshes and made fertile arid regions and reclaimed land from the sea, vast new areas were

opened to agriculture. The cities themselves began to do their part in food supply, for large meat and fruit canning factories, flour mills, sugar refineries, and innumerable other industrial establishments concerned with the manufacture of food products grew up, and a vast number of people became engaged in marketing foods.

Inventive genius and enterprise have helped in many other ways in the gigantic task of feeding the world. For instance, canning and drying processes have made perishable fruits, vegetables and fish available at all seasons. Refrigeration plant on ships and trains make it possible to transport many fresh foods to distant places. Methods of fast freezing at very low temperatures are now employed to preserve the flavour and quality of perishable foods that were formerly destroyed by gradual freezing. (See Refrigeration)

### Specialization in Food-farming

In this new age people and nations have become more and more dependent on one another for their food. The farmer is just as dependent upon the city as the city is upon him. He has learned to specialize so that we now find commercial farms confined to cereals, dairy products, poultry production, etc. With the money from the sale of his products he buys from the city manufactured goods and such food products as his farm does not supply.

In large countries like Canada, the United States and Argentina the agricultural areas could feed the industrial sections with little help from the outside, but the farmer is dependent upon the needs of other nations for a market for his surplus crops. Then, too, as civilization advances people want more and more variety in their diet. Today there are millions of people in every large country who demand many foods which must be imported from other parts of the world. The wide spaces of North America, Australia and Argentina send wheat and meat half way across the world, the cold waters of the northern latitudes contribute most of the world's fish supply, and sub-tropical regions supply exotic fruits throughout the year.

With these developments the science of nutrition now keeps pace. It only requires a better balanced world economic system to ensure full nutrition for all peoples out of earth's plenty.

### Energy from What We Eat

Every time you wink your eye, or move your arm, or take a breath, you are using the energy provided by food previously eaten. Our foods supply the energy for the movement of our bodies just as petrol supplies the energy for moving a motor car. They also furnish the fuel that keeps our bodies warm. Our

## FOOD



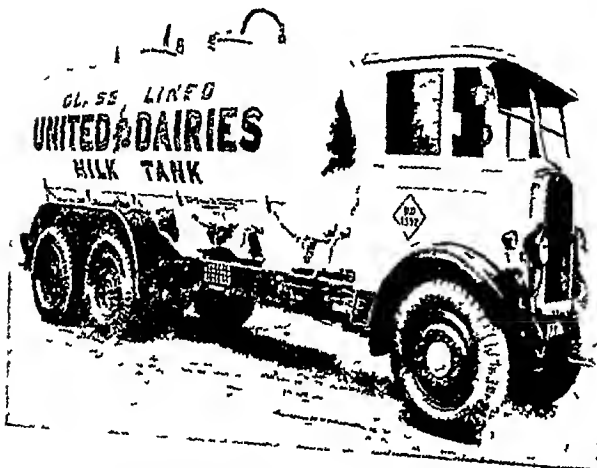
### MEAT AND POULTRY

The best of the meat we eat comes from the famous herds of cattle in England and Scotland. Above is the scene at the Norwich cattle show when the judges are awarding the prizes. On the right is a poultry farm typical of those from which we get fowls and eggs.



bodies are constantly losing heat, and they would soon become cold if we did not keep supplying them with fuel in the form of food.

If we compare our bodies to an engine we shall at once realize the great importance of our foods. Furnishing the fuel to run the human engine is only one of their tasks. In addition to this, foods build up the materials of which the engine is made, they repair the parts as they wear out, and they furnish the lubricating oil that makes the engine run smoothly.



In other words, foods help us to grow, they give us strong teeth, bones and muscles, and they make sensitive nerves and red blood. They renew our tissues as they wear out. They keep up the fuel supply that gives us energy and provide future reserves which we store up in the form of fat. They also keep our body engines regulated by supplying the minerals, vitamins,

### MILK FOR LONDON

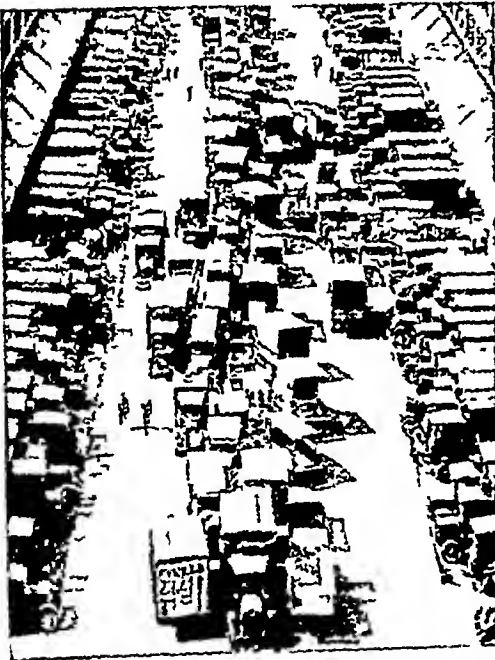
Besides the old-fashioned milk churns such lorries as that on the left, with glass lined tanks, bring much of our milk from the country to the town.





#### FOOD FOR MILLIONS

These photographs show respectively the interior and exterior of two of the greatest food-distributing centres of the world. Above is a scene in Smithfield Market, which supplies London with its meat, and on the left are some of the lorries which carry Chicago's daily supply of fresh food and vegetables.



roughage and other materials needed to make them run smoothly.

Some of our foods are chiefly valuable as heat and energy producers, others are good body builders, and still others are needed primarily as regulators. Many foods that we eat help in all three of these tasks. By analysing foods chemically, scientists are able to tell us just what work is performed by different foods. Thus they do by determining what nutrients, or

nourishing materials, they contain. They can also tell just how much of each of these nutrients the body needs and what will happen to our bodies if we fail to supply them.

Scientists have divided the nutrients contained in food into five classes: fat, proteins, carbohydrates, minerals and vitamins. Fats, proteins and carbohydrates are all fuel foods. Proteins and minerals are essential to body building and repair work. Minerals and vitamins play a necessary part in assisting to regulate the metabolism (chemical changes) of the body. Another important regulator is water.

The more active we are, the more fuel our bodies consume. Children use more food than do adults, in proportion to size. Adults who work or play hard use more than inactive persons. Furthermore, the larger and heavier the body, the greater the amount of energy used in moving it. A large man requires more food than a small one, an adult more than a child. Adolescents who are growing rapidly toward their full size and who are very active, require more fuel than do children or adults. In cold climates our bodies lose heat rapidly, consequently people in cold countries need more food, particularly heat-producing foods like fats, than people who live in warm lands.



## FOOD

The amount of heat contributed by foods is measured in *calories*, as weight is measured in pounds. A calorie is the amount of heat required to raise the temperature of a kilogram of water (about a quart) one degree Centigrade. While an eight-year old child may require 1,500 calories each day, a growing school boy may need as many as 4,000 calories, and his father perhaps only 3,500.

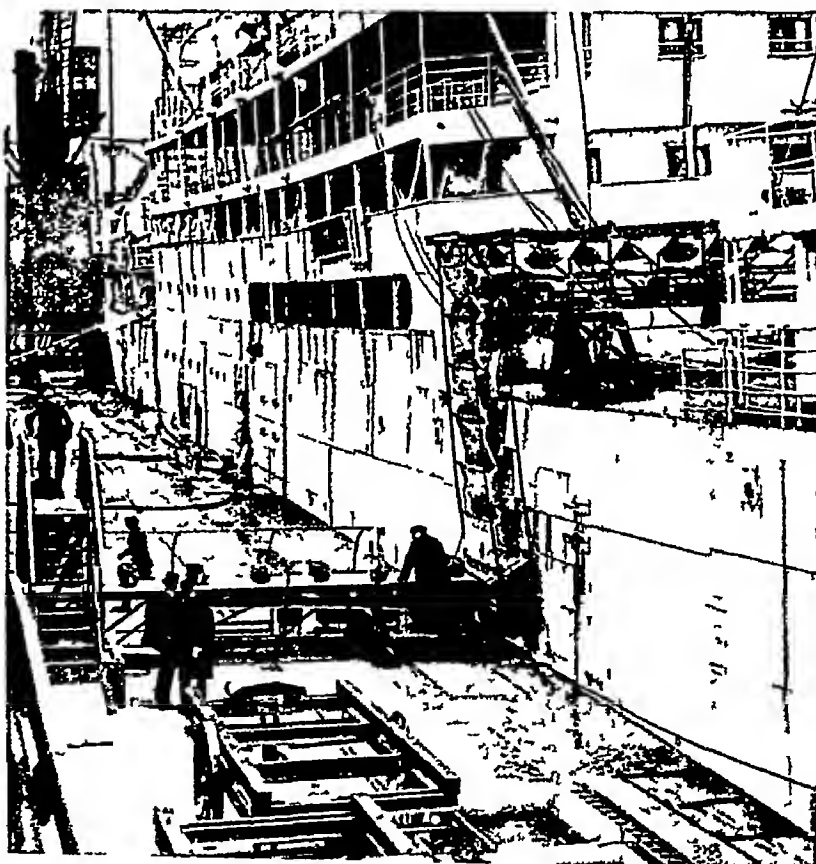
### Foods that Make You Warm

Foods vary in the amount of heat they are made to produce in the body. Have you ever seen oil or lard burn? If you have, you will know that they give a very hot flame. Similarly the fats in our bodies, such as butter and oil, give many calories of heat. They are the greatest heat producing foods. The fats occur in both animal and vegetable foods. Butter, cream, lard and the fat of meat are typical animal fats. Olive oil and cocoa butter are vegetable fats. When we eat more of the fats than we immediately need for heat and energy, the excess is stored in our bodies as fat. It is deposited as a layer of fat just under the skin, covering the bones and filling out the hollows between the muscles, and in various places about the organs within our bodies. This is one reason why we can live for some time without food, we are able to exist on our reserve fat for energy. Primitive peoples, whose food supply was often very irregular, could survive times of famine by using up the fat that they had stored in their bodies when food was plentiful. Even today, when most of us have three meals a day, we call upon our reserve fuel supplies when we are ill.

The carbohydrates, which are chiefly the sugars and the starches, are also heat producers. Sugar, in particular, is a better fuel for muscular work than is fat. The carbohydrates, however, contain only about 1,820 calories to the pound, whereas the fats average 4,080 calories. In other words, the fuel value of the carbohydrates is less than half the fuel value of the fats. It should be noted, however, that our tolerance for fats is considerably less than for sugar and starches. Carbohydrates, which include bread, potatoes, fruits and vegetables, form the bulk of our diet.

While protein foods, such as eggs and lean meat, may supply fuel for the body, their most important service is in building and repairing its tissues. Whether we grow as strong and tall as we might do depends on whether we supply the right kind and amount of building materials. For growth and repair of tissues the body must have a constant supply of proteins of the variety and quality required. Proteins, for example, are used largely in the building of the muscles, and if our foods do not contain enough of them, our muscles will either be smaller than they might be or they will be of poor quality. Though proteins are found in both animal and vegetable foods, they are of different kinds, and not all of them are equally nourishing. Meat contains the highest percentage of protein. Milk, eggs, fish, shell-fish, cheese, nuts, beans, peas and cereal products are other foods that contain a large amount.

Minerals are widely distributed among our foods, and almost any mixed diet supplies a sufficient quantity of the minerals that our bodies need. Two important minerals, however, may not be contained in sufficient quantity in our ordinary diet, and we must have them in mind when we select our foods. One of these is



**UNLOADING A JAMAICAN FOOD-SHIP**

Here you see bunches of Jamaica bananas being carried, on an "endless belt" system, from the ship's hold to warehouses and railway trucks, at East India Docks, London. Your grandfather probably remembers when bananas were a rare novelty in England, but today £10,000,000 worth are shipped to Europe and U.S.A. yearly. Bananas are rich in starch, which changes to sugar on ripening.



### FOOD FOR THE TODDLERS

The value of milk as a food for small children is now recognized by the educational authorities for a poorly-nourished child is generally a poor scholar. In many Council Schools the children can buy a third of a pint of milk in a bottle for a halfpenny. As milk drunk quickly is indigestible, straws are provided to ensure that it shall be consumed slowly.

lime (calcium) If we do not get enough lime, our bones will be small and weak and perhaps misshapen. Our teeth will be of poor quality, and our blood will lack an essential element.

Milk is the best source of calcium. Every child needs a quart of milk a day, an adult requires from a glass to a pint, depending on what other foods he eats.

Egg yolk and cheese contain more calcium than do most foods. Some vegetables contain small amounts. Meat is poor in calcium. We should need 12 pounds of meat and 4 loaves of bread daily to supply our calcium needs if these were the only foods we ate. Therefore, since we all wish to have strong bones and sound teeth, we must not neglect milk in our diet. In the assimilation of calcium into the tissues for development and repair vitamin D, the sunshine vitamin, plays an active role. (See Vitamins)

Iron is another mineral essential to growth and health. If we get too little iron, our blood will not be of a rich red colour, and it will not be able to do its work of carrying oxygen to all parts of the body. As a result, we shall become anaemic and weak. Liver, egg yolk, syrup, whole wheat, peas, prunes and spinach are comparatively rich in iron. Lean meat, if the blood has not been washed out of it, is an excellent source of iron. Recent studies show that not all of the iron in foods is available for use

in the body. Only 25 per cent of the iron in spinach is usable, whereas 60 per cent of the iron in liver and 50 per cent of the iron in beef is available for use. It has also been found that copper as well as iron is necessary for building the colouring matter (haemoglobin) in our red blood cells.

Two other minerals, phosphorus and iodine, are lacking in some diets. If we get enough protein, we need not worry about phosphorus, for most foods that contain protein also contain phosphorus. Like calcium phosphorus is used for bones and teeth, it

is also a constituent of nerve tissue. Iodine is needed by the thyroid gland, an important secreting gland in the neck which secretes thyroxin directly into the blood stream. (See

Vitamin "A"		Vitamin "B"	
Cod liver oil + + + Butter + + Egg yolk + + Liver + + Beef fat + + Heart + Mutton fat + Milk + Herring mackerel + Green vegetables + +		Wholemeal cereal products + + Dried peas and beans, lentils + + Egg yolk + + Liver heart pancreas brain Kidney + + Yeast extract (marmite) + + + Fruits and vegetables + Nuts + + Yeast + + +	
Fresh fruits especially orange lemon grape fruit tangerine, tomato + + + Raspberry blackberry + + Peach + + Other fruits mostly + Raw green vegetables + + + Cooked green vegetables + + + (if cooked for short time) + Potatoes + Swede turnips +		Meat Egg Milk and cheese Fish	
Vitamin "C"		"Good Protein"	

+ + + Very Good      + + Good      + Fairly Good

### DIET A REALLY 'SQUARE' MEAL

However rich food may be in fat and carbohydrate and mineral salts (represented in the circle of the diagram), it is seriously incomplete without some definite proportion of vitamins and good protein i.e., efficient tissue-building element, by which the circle is squared off.

Gland) In some regions usually far from the sea, iodine is often lacking in the soil and water and must be supplied by including such sea foods as fish or iodized table salt in the diet. In certain districts in India, U S A, Switzerland and England many people are afflicted with goitre, an enlargement of the thyroid gland, due in some cases to insufficiency of iodine in the dietary (See Iodine)

Chief among the regulators of metabolism are the vitamins, which are named by the letters A, B, C, D, E and G. Even though we supply the fuel and the building materials, the body cannot use these satisfactorily without the vitamins. We still know little about what the vitamins are and how they work, but we do know what foods are rich in vitamins and what happens when we do not get enough of them. We know that vitamins help us to grow, and that they protect us against such diseases as scurvy and rickets.

Many people have obscure ailments that probably are caused by failing to get quite enough vitamins for health. Tiredness, irritability, weakness and frequent colds and other infections may be evidence of such a condition.

Roughage is needed in the diet to keep our digestive organs working satisfactorily. Roughage consists largely of the coarse indigestible fibres found in most vegetables, in the bran of whole grain cereals, and in the skins and pulp of fruit. It is made up of the tough cellulose which forms the walls of plant cells. Green vegetables and fruit are the best foods to eat for roughage because they supply minerals as well.

Although many of our foods contain water, we need to drink at least six glasses of water a day to keep our bodies working smoothly. Water makes up nearly two thirds of our weight. We use it in breathing, and also to throw off waste by perspiration and through the kidneys and bowels.

By supplying the right kinds of foods in the right proportion—that is, by a “balanced” diet—we give our bodies an opportunity to serve us well from childhood until we are old. When we fail in any respect, we may be sure that in the long run we shall suffer for it.

**How To CHOOSE A DIETARY**  
Thanks to the resources of modern transport there is today no difficulty in choosing all the year round a dietary that will fulfil the demands of adequate nutrition. Fortunately, price does not enter into the problem to the extent commonly believed, for the

dearest and rarest food luxuries are often the least nutritious.

From the tables given below of common food-stuffs the average household may be fed both scientifically and economically with resultant gain to health, stamina and pocket.

(a) *Protein Foods mostly with Carbohydrates*

Beef	Eggs
Mutton	Salmon
Pork	Herring
Chicken	Cod

(b) *Protein Foods with Carbohydrates*

Milk	Peas
Cheese	Beans

(c) *Carbohydrate Foods*

Bread	Sugar
(brown better than white)	Potatoes
Oatmeal	Dates
Rice	Currants
Tapioca	Raisins
Jams and Syrups	Bananas

(d) *Foods containing Fats*

Butter	Lard
Cream	Pork (salt)
Cheese	Bacon (cured)

(e) *Foods containing Minerals and Vitamins*

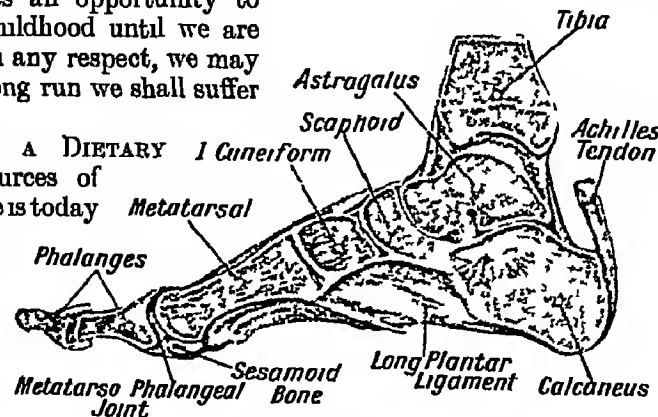
Peas	Spinach
Beans	Apples
Cabbage	Bananas
Carrots	Plums
Mushrooms	Pears
Oranges	Tomatoes

**Foot.** The possession of specialized members for moving about on land is characteristic of the higher grades of animal and it is only as we ascend the scale of animal life that we find true feet and legs beginning to make their appearance. In invertebrates there may be a very large number of feet and legs, but in the vertebrates there are four—two of them being later developed as hands in the higher forms.

A comparison of the foot in various animals brings out many interesting differences. In the human foot we distinguish the ankle (*tarsus*), the instep (*metatarsus*), and the toes (*phalanges*). Man's heel rests upon the ground, and so Man is “plantigrade” (from Lat *planta*, sole), the bear

also has such a foot. Other animals, like the cat and dog, walk on their toes or digits, making them “digitigrade,” with the heel up in the air and the instep lifted away from the earth.

In deer, cattle, horses, and some other animals the elevation of the heel has been carried farther, and the animal stands on the tip end of a single toe, the heel, instep, and digits are then



**STRUCTURE OF THE HUMAN FOOT**

From heel to toes, the foot is built exactly like an arch. The calcaneus is the bone forming the hind pillar, and the metatarsals form the front pillar. The astragalus is the keystone.

# THIRTY KINDS OF FEET! HOW MANY DO YOU KNOW!



Just as a good shoemaker makes shoes to fit the feet Nature makes feet to fit the needs of each individual animal. How many of these feet could you name? They are, from left to right, first row—Horse, Elephant, Eagle, Newt, Ostrich, Camel, second row—Chimpanzee, Tiger, Duck, Water Shrew, Lizard, Tiger Beetle, third row—Sloth Bear, Locust, Flamingo, Duck-billed Platypus, Crab, fourth row—Pecary, Garden Spider, Giraffe, Frog, Armadillo, Ox, and fifth row—Kangaroo, Box Turtle, Squirrel, Iguana, Harvest Mouse, Gecko.

away from the earth, the tip end of one toe only being in contact. The heel bone, to which is attached the "tendon of Achilles," can be clearly seen in each of the three.

The horse has the most remarkable example of a modified foot. Not only are the heel and instep off the earth, but the bones of the instep have become reduced to one, and the animal walks upon the tip of a single toe on each of his four feet. But it has been shown by fossils that the horse's foot has evolved from that of a five-toed ancestor. (See Evolution, Horse)

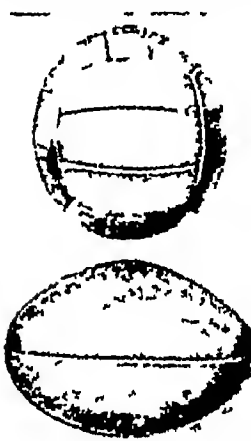
The animals which have feet most nearly resembling those of Man are the monkeys and apes. But their feet are more like hands, for the great toe can be used like a thumb, and there is no arch in their feet, such as Man has developed. Indeed, the arched instep, adding spring to the step, is one of the things which distinguishes Man from the beasts.

The foot as a measure of length comes from the assumed length of the human foot, and is very old. The Greek foot was 12.45 inches long, and the Roman 11.65 inches.

## HOW to PLAY 'SOCCER' and 'RUGGER'

*Britain is fortunate in having two national games—cricket for summer, and football (of two kinds) for winter. The latter commands the majority of supporters, although it is less comfortable to play or watch.*

**Football.** Football has long been our principal winter pastime. No one knows exactly how it was first introduced into England. The



'Soccer' (top) and Rugby Balls.  
Geo. Grosse Ltd.

ancient Romans and Greeks had their "ball games," and it is probable that football had its origin in one of the games brought to this country by the Romans. At one time it was unlawful and was punishable as a crime, just as much as stealing was.

The earliest authentic references to the pastime occurred in the 12th century, but for long it was banned by the authorities.

One of the objections was that it interfered with the necessary practice of archery. It was not until the 17th century that it began to find any encouragement in high quarters, and Charles II is said to have been the first king to arrange a game. From then onwards, except for a few years early last century, it increased in popularity.

One of its most bitter opponents in days of old was King James I. In his book on the sports of the period, he attacked the game and referred to it as "rough and violent exercise." Another writer described it as being "too rough for jest." But the game of "football" as it was played then was a very different thing from the scientific exhibition we see today.

It has not always been customary to report football matches, and we do not know much about the game as it was played originally. We have evidence, however, that not so very long ago a game took place in which all the players wore boots with projecting nails. The pitch was some 200 yards long, and the goals con-

sisted merely of two upright posts without a cross-bar. Even the 1860 rules of the Blackheath Rugby Club allowed the practice of "hacking" an opponent.

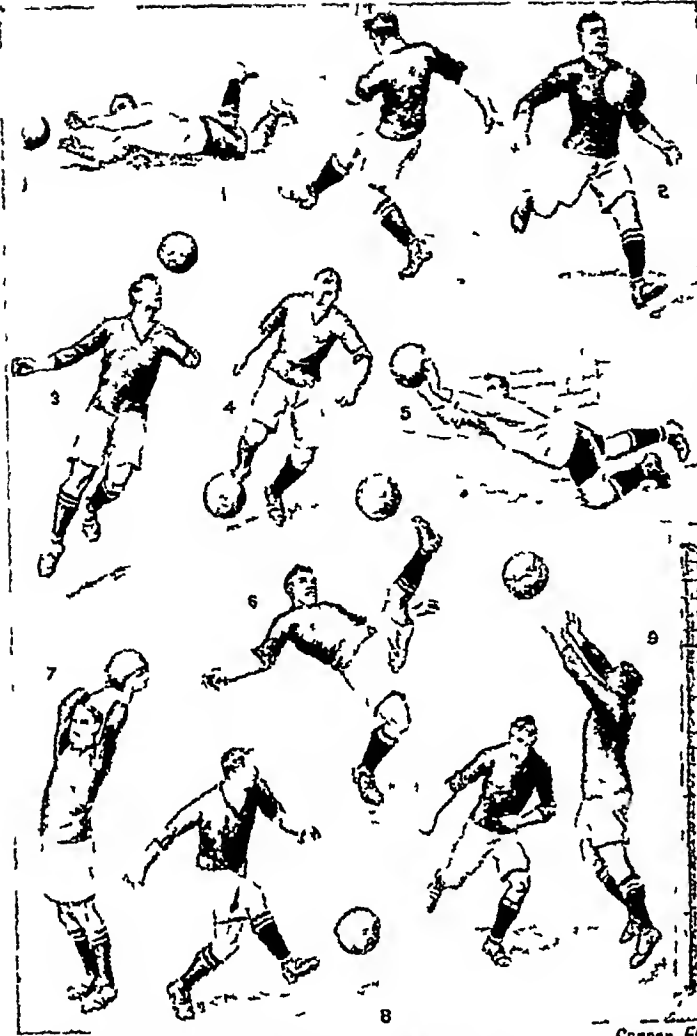
The Association game is controlled by the Football Association, which was formed in 1863. Rules were drawn up, referees were appointed, and many improvements were made. Gradually the game became less rough and more skilful until the present day standard of excellence was reached.

America and certain of the English public schools have their own particular kinds of football, but we shall confine ourselves to a description of the two main codes as played in Britain—Association ("Soccer") and Rugby ("Rugger"). The chief difference between the two is that in the latter handling is permitted, whereas in Association it is almost entirely forbidden.

**Association.**—Each team has eleven players—five forwards, three half backs, two full backs and a goalkeeper. The only member of the side who is allowed to touch the ball with his hands while it is in play is the goalkeeper, and his side is penalized if he carries it more than two steps, or handles it outside the penalty area. The ball is round, has a circumference of 27 to 28 inches, and must weigh not less than 13 nor more than 15 ounces. Play is of 45 minutes' duration each half, and after the interval the teams cross over. The object of the game, started by the centre forward "kicking off" from the middle of the half-way line, is to score goals by kicking or heading the ball into the opponents' goal, the team scoring most goals winning the game.

The game is stopped, and a free kick awarded to the other side, if a player is guilty of tripping or otherwise "fouling" an opponent, or if he handles the ball while it is in play. If the ball is sent beyond the touch (side) lines, it is thrown in by one of the other team. Should a member of a defending side cause the ball to go over his

## FOOTBALL



### 'SOCCER' PLAYERS IN ACTION

Above are various incidents in a game of Association football (1) Scoring a goal (2) breasting the ball, (3) heading, (4) dribbling, (5) a good save by the 'goalie', (6) overhead clearance, (7) throwing in, (8) a pass (9) goalkeeper punching clear. On the right is the plan of the field of play.

own goal-line, a "corner" (a kick taken from near the corner flag) is awarded to the other side by the referee—the sole controller of the game.

The technique of the game has altered considerably in recent years, the individual art of "dribbling"—running along with the ball in front of the toes—having been dropped in favour of teamwork and tactical passing.

One of the most difficult of the referee's many tasks is to decide whether a player is "off-side". A free kick is given for this offence if a man receiving the ball had not at least two opponents in front of him at the time the ball was last played. He cannot, however, be off-side in his own half of the field or from a goal-kick or a throw-in.

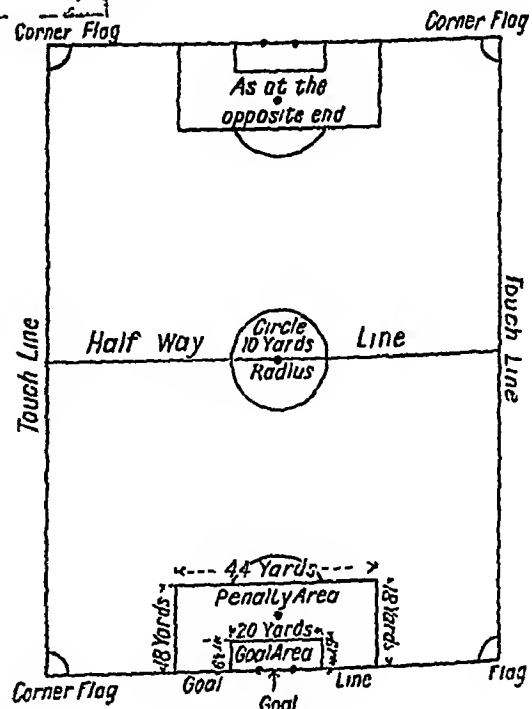
Twelve yards from the goal is the penalty spot from which the penalty kick is taken when the referee has adjudged a foul to have been

committed within the penalty area. Players of the penalized side (except the goalkeeper) are not allowed to defend their goal, so that in most cases a penalty kick results in a goal.

Every year all the big teams, amateur and professional compete for the F A Cup, the final of which, played at Wembley Stadium, is the climax of the 'soccer' season. The principal professional clubs in England are organized within the Football League into three Divisions, the Third Division having a Northern and a Southern Section. Enormous crowds pay each Saturday to see their favourite team in action.

The 'Internationals' between the "home" countries, England, Ireland, Scotland and Wales, are sometimes supplemented by matches with teams from foreign countries.

The dimensions of the playing field are length—minimum 100 yards, maximum 130 yards, breadth—minimum 50 yards, maximum 100 yards. The goals are 8 yards wide and 8 feet high. To mark the goal area lines are drawn from a point 6 yards from, and at right angles to, each goal post for 6 yards, and then connected by a line drawn parallel to the goal-line. To mark the penalty area, lines are drawn 18 yards from each goal-post for a distance of 18 yards.





## FOOTBALL

at right angles to the goal-line, and connected by a line parallel to it

**Rugby**—The ball used in this game is oval in shape, about 11 inches long, and weighs between 13 and 14½ ounces. A team consists of fifteen players, usually made up of eight forwards, two half-backs, four three quarter-backs and one full-back. ("Seven a sides" are also played by some clubs as an end-of-season variant). The scoring is made by tries and goals. A try is scored when a player succeeds in "touching down" behind his opponents goal line, and counts three points. A converted try adds two more points to the score. A goal is scored when the ball is kicked between the posts and above the cross bar. A dropped goal counts four points and a penalty goal or a goal scored from a mark, three points.

Passing the ball forward is not allowed, and for this and other minor infringements of the rules a "scrummage" is usually formed by the forwards packing down and trying to shove the other side off the ball, which is inserted by the scrum-half. Should the ball be successfully "hooked," and his side be in an attacking position, the scrum half will normally set the three quarters in motion. The full-back is the last line of defence, and should be a sound "tackler" and kicker.

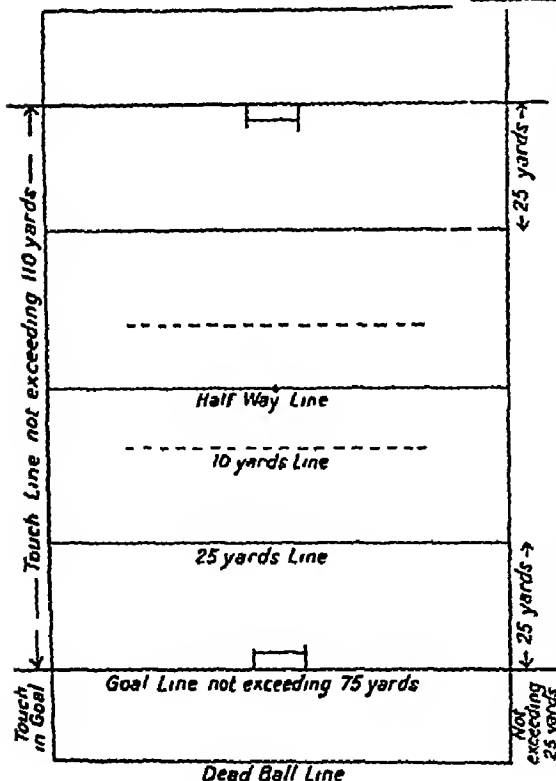


### THE RUGBY 'HANDLING CODE'

Unlike Soccer players (see opposite), Rugby footballers are allowed to handle the ball. The field of play is seen below left while above are players (1) passing on being tackled, (2) taking the pass, (3) about to kick, (4) tackling, (5) scoring a try, (6) place kicking, (7) running with the ball, (8) making a mark, and (9) in a 'tight' scrum.

Usually, play is of 35 minutes' duration in each half. English amateur Rugby football, invented by a Rugby schoolboy, W. W. Ellis, in 1823, is controlled by the Rugby Union, formed in 1871. International matches between England, Scotland, Ireland and Wales are played every winter. The English headquarters of the game are at Twickenham, where other big matches—such as the inter-Varsity and inter-Services series—are played. Visits by great teams from New Zealand (the "All Blacks") in 1905, 1924 and 1935 aroused great enthusiasm. The public schools have in many cases adopted the Rugby game. Professional clubs in the north of England play a game (Rugby League) in which only thirteen players form a team, and which differs somewhat in other respects from the Rugby Union game.

Dimensions of the playing field for the latter are 75 yards wide and 110 yards long. The field

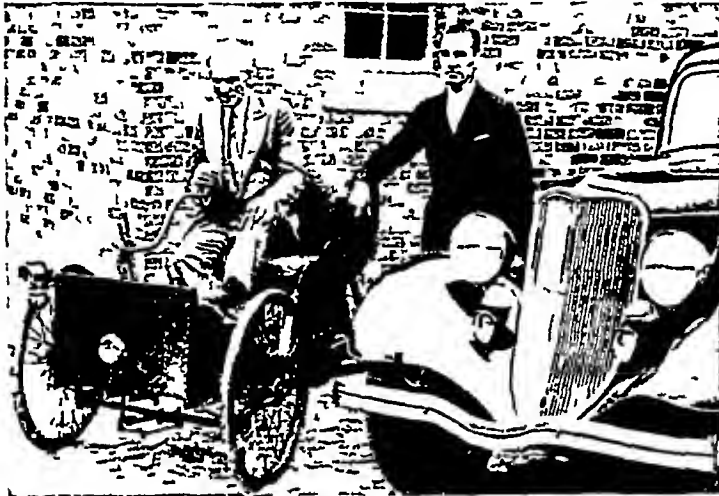


is further marked out by two lines drawn parallel to the goal-lines 25 yards distant. The "drop-out," corresponding to the goal kick in "soccer," is taken from this line. Goal 18½ feet wide with a cross-bar 10 feet from the ground. Uprights must extend at least a foot above the cross bar.

**Ford, HENRY** (born 1863) In 1893 a "horseless buggy" chugged through the streets of Detroit, Michigan, U.S.A. Crowds gathered whenever it appeared. Terrified horses ran

repaired steam-engines used on farms. In 1884 he took charge of a 40 acre farm his father had given him, married, built his own house from timber felled by himself, and seemed to have "settled down." But after two years of farming he went back to Detroit and worked as night engineer for the Detroit Edison Company.

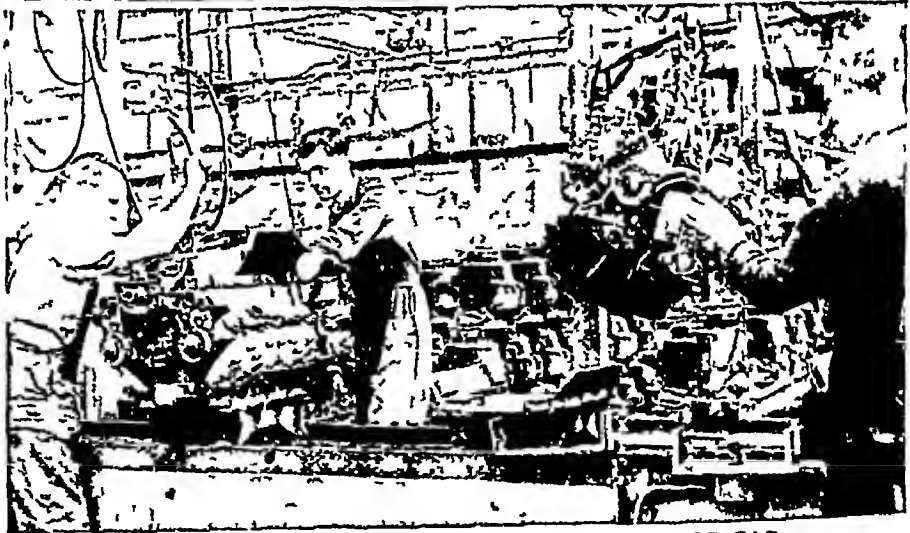
There he began to experiment with a petrol motor vehicle, it was finished in 1892. Having run this car for some time, he sold it for 200 dollars to acquire the capital to build an improved machine. Finally, in 1899, he left his engineering post and founded the Detroit Automobile Company. But the business men whose financial support he was forced to seek refused to manufacture the type of car Ford insisted upon. He wanted to build a universal car which could be made in quantities, they wanted to make cars to order. He, therefore, resigned in 1902 and built two racing cars, one of which established, by an unbroken series of victories in speed events, a reputation which enabled him to found the Ford Motor Company early in 1903. The original subscribed



away at its approach. The police sought to curb this nuisance by forcing its driver, Henry Ford, to secure a licence. That motor car was the first of many millions produced by the genius who was destined in later years to make more cars than any other man in the world.

Henry Ford was born July 30, 1863, on a farm near Dearborn, Michigan. His mother died when he was twelve. He helped on the farm in summer, and in winter attended a one room school. Watches and clocks fascinated the boy, and he went about the countryside doing repair work without pay. Years later Ford remarked, "My toys were all tools, they still are."

At sixteen Ford secured a job in a machine shop in Detroit, putting in four hours every night as a watchmaker's assistant. Later he worked in an engine shop, and set up and



#### HENRY FORD GENIUS OF THE MOTOR CAR

It was in 1892 that Henry Ford produced his first motor-car. The upper photograph shows the great industrialist sitting in that historic machine, with his son Edsel and a 1933 model Ford saloon beside him. Ford has built up the most amazing factory system in the world, the English Ford works at Dagenham (below) are capable of producing 120,000 vehicles a year, using the same mass production methods as the American firm in Detroit.

capital was 28,000 dollars, in thirty years the capital stock was over 17 million dollars and the profit surplus nearly 600 million dollars.

The original car, a twin cylinder of 8 h.p., was gradually developed until 1909, when Ford decided to concentrate on a one design programme with the famous model T. This model was continued until 1928, when a new model was introduced, to be followed in 1931 by the

small 8 h p and the large 8-cylinder designs. Throughout his career Ford kept his three original points in front of him—simplicity, lightness and low initial cost. He aimed to make every part that went into his cars. He acquired iron and coal mines, forests, mills and factories to produce and shape his steel and alloys, his fuel, wood, glass and leather. He built up railway and steamship lines, and an aeroplane freight service, in order to transport his products. In his search for lightness he discovered, as far back as 1908, the alloy vanadium steel, which was to become the basic metal in all motor car construction. The same methods he applied to the farm tractors, which, under the name of Fordson, became famed for efficiency and economy.

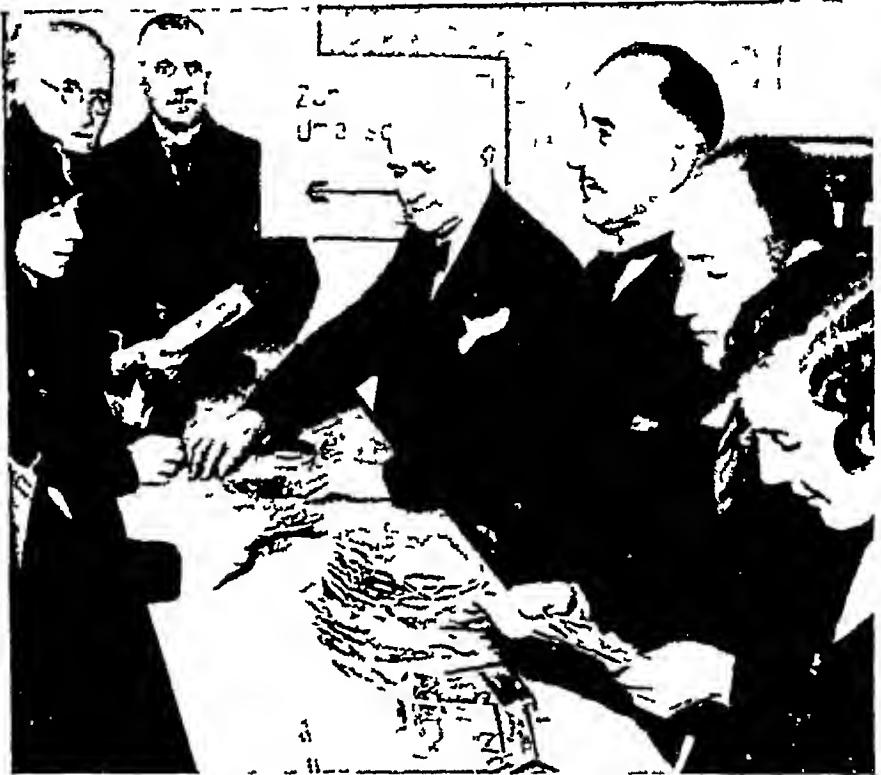
Mass production was Ford's main idea. Each man was given only one task, which he did over and over until it became automatic. Conveyers brought the job to the man, instead of the work man wasting time going to the job. To cut shipping costs, parts instead of cars were shipped from the main plants, and then assembled at branches all over the world.

With all his business sagacity, Ford has always been something of a dreamer and an idealist. He detested charity. Maintaining that any efficient organization should be self-supporting, he founded a trade school and a hospital to demonstrate his ideas. The pupils at the trade school earned a living while learning, and at the hospital all fees and salaries were fixed at definite rates. His contempt of competition and his insistence on every man's right to independence were reflected in Britain, where at his works at Dagenham he refused to conform to the motor manufacturers' central organization or exhibit at Olympia.

His son, Edsel Bryant Ford, was born November 6, 1893, and from the start of his active career was identified with his father's business. He became president and treasurer of the Ford Manufacturing Company in 1919.

**Foreign Exchange.** When we make a purchase in a shop we may pay cash for it—that is, we hand to the shopkeeper notes or

coins equivalent to the price charged—or we may give him a cheque for the amount. But when we want to buy something from abroad we find the matter nothing like so simple, because the people abroad do not use the same sort of money as we do. If, for instance, we want to order a dress from Paris we shall find that its price is quoted in francs, or if it is an American typewriter we require, it will be quoted in dollars. But we use pounds, shillings and pence. How shall we convert the one sort



#### EXCHANGING FRANCS FOR MARKS

Wide World

After the World War the coal-fields of the Saar Basin were taken from Germany and ceded to France for 15 years in accordance with the Treaty of Versailles. At the end of that time, the inhabitants decided by plebiscite to return to Germany, here you see some of the Saarlanders exchanging their French money into German marks.

of money into the other—English money into French or American? Bank of England notes are encashable almost anywhere (they have recently been in considerable demand in France as a safety-first security) in the ordinary way, and a first class cheque could in most cases be tendered. These would be taken at the exchange of the day ruling in the country where tendered and exchanged for, say, francs or dollars, but obviously there would, as a rule, be a difference to be met by the sender or to be received by him.

For individual purchases this method of paying directly in one's own currency might work, but for transactions between big business interests it would entail complications.

The problem is one of "foreign exchange," and in most big commercial centres—indeed, wherever there is a bank—there are people whose business it is to arrange for the exchange

## FOREIGN EXCHANGE

of English money into foreign and vice versa. They deal in what are called "bills of exchange" which may be looked upon as cheques made payable abroad as well as at home.

Let us see how the system works. Suppose John Brown & Co are publishers in London and they sell £50 worth of their books to a firm Henry Washington, Inc., in New York. When they send the consignment, they post with it or at the same time a bill of exchange, made out in their favour for £50. Washington's "accept" the bill and send it back to Brown's. It is now a promise by Washington's to pay Brown's in three months' time £50. If Brown & Co do not mind waiting three months for their money, they leave the bill with their bankers for collecting on due date, or alternatively they may cash it now, receiving a little less than the bill's face value (the difference is the interest on the money for the unexpired portion of three months).

So it comes about that in the banks there accumulates in the course of a day's business a large number of bills of exchange—promises signed by Americans to pay pounds to British firms at certain dates. Similarly in New York and other American cities there will be a big collection of bills accepted by English traders—promises to pay dollars to Americans at certain dates.

The obvious thing to do is to set the two lots of bills against each other, and this is what in fact happens. The transfer is done through banks or special firms of bill brokers. Thus, in the case quoted above, Washington's would go to a bank or bill broker's and buy from them a bill accepted by an English firm to pay an American firm £50. This they send to Brown's, who collect the £50 from the acceptor. So the account is settled without any money actually crossing the Atlantic.

But there are many other demands for foreign currency than that to settle accounts in business. Thus a Swiss waiter may want to send some money home to his parents in Bern, or an Irish policeman in Chicago may want to send a Christmas present to his sister in Dublin. How is the one to get Swiss francs for his pounds, and the other £sd for his dollars?

They do it at a bank or exchange bureau. On inquiry the waiter finds that for £1 he can buy a money order for, say, 25 Swiss francs, and the policeman hands over, say, \$4.95 for every £1 he wants to send to Dublin. But if

the transaction had taken place the day before or a day later, or even at a different time in the same day, they would have found a different number of Swiss francs or American dollars and cents quoted per pound sterling.

This is because the "law of supply and demand" prevails in the money market as in other markets. If there is a bigger demand for Swiss francs than for English pounds, then the value of Swiss francs expressed in English money will tend to rise, if on the contrary the demand for Swiss francs falls in relation to pounds then their price will fall. In the same way, the rate of American dollars expressed in pounds rises and falls with the state of trade.

The rate at which one currency will exchange for another is called the rate of exchange, and in the newspapers every day will be found a table giving the rates of exchange between London, which is the financial centre of the world, and all the other principal capitals of the world. Thus in the one on the left we see the rates that prevailed on November 22, 1937.

The table is self explanatory, except, perhaps, for the phrase "par of exchange." This refers to the time when the basic unit of each currency, e.g., the English pound, French franc, and American dollar, were stated by the government of the respective country to be equivalent to so much gold, when paper pounds, francs, and dollars might be converted into gold on demand at certain fixed rates. This no longer applies, however, for the

"gold standard" has been abandoned by nearly all the great countries of the world. The ratio between the currencies is now determined by the supply of and demand for each currency, and these depend in turn upon the general level of prices that prevails in the various countries.

Thus if prices in England are low as compared with the prices charged for the same goods in America, people in America will tend to make purchases in England. Hence there will be a demand for English pounds to pay for the goods bought and the value of the pound sterling will rise as compared with the dollar. If prices are higher, on the other hand, in England than in America, English people will want to buy from America, and this will lead to a rise in the value of the dollar.

In course of time the rising value of the pound or dollar, as the case may be, will make purchases dearer until equilibrium is established.

	Method	Prev	par	
	of quot	of ex	ing to	change
New York	dollar	—	5 001	5 000
Montreal	dollar	4 86	4 991	4 393
Paris	franc	124 21	147 1/2	147 1/2
Brussels	belga	—	20 39	29 42
Amsterdam	florin	12 11	9 01	9 02 1/2
Zurich	franc	25 22	21 60	62 1/2
Milan	lire	92 46	94 1/2	95 1/2
Berlin	marks	20 43	12 36	12 39
Warsaw	zloty	43 38	26 1	26
Oslo	kroner	18 16	19 85	19 95
Copenhagen	kroner	18 16	22 35	22 45
Stockholm	kroner	18 16	19 35	19 45
Madrid	peseta	25 22	60 100	nom
Lisbon	escudo	110	110	110 1/2
Finland	mark	193 2	225 1/2	226 1/2
Haga	lats	25 22	24 1/2	25 1/2
Danzig	gu den	—	26 1	26 1/2
Athens	drachma	375	540	555
Budapest	pengo	27 82	24 1/2	25 1/2
Bucharest	lei	813 58	665	690
Belgrade	dinar	276 20	211	221
Vienna	schilling	34 59	25 1/2	27 1/2
Prague	kroner	164 25	141 1/2	142 1/2
Alexandria	piastre	97 1/2	97 1/2	97 1/2
Istanbul	piastre	110 71	619	—
Bombay	rupee	1 56d	1 6 1/2	1 6 1/2
Hong Kong	dollar	—	1 2 1/2	1 3 1/2
Shanghai	dollar	—	1 1 1/2	1 2 1/2
Singapore	dollar	2 40	2 4 1/2	2 4 1/2
Yokohama	yen	2 0d	1 1 1/2	2 1/2
B Aires	Paper pesos	to £	16 85	17 02
Lima	soles	17 38	18 75	19 75
Monte Video	pesos	4 3d	39 1/2	39 1/2
Mexico	pesos	9 76d	17 1/2	18 1/2
Rio	milreis	5 89d	2 1/2	2 3/4
Valparaiso	pesos	40	125	—

FOREIGN EXCHANGE QUOTATIONS

International financiers and financial syndicates buy and sell currencies for profit, just as merchants buy and sell commodities. To counter the operations of these speculators the governments of Britain, France, and USA have created enormous "Exchange Equalization Funds," which they employ to stabilize exchange rates and prevent profit making.

**Forel, August (1848-1931)** The ant community has been an object of study for politicians, philosophers, and thinkers of every type as well as entomologists, from the time of Solomon, but August Forel was probably the only psychologist to analyse the insect mind. His name is undoubtedly best known for his works on the human mind and its diseases, but to him it was in a sense a matter of indifference whether he studied the mind of Man or the mental powers of an insect. Thus, though he occupied for many years the chair of Morbid Psychology at Zürich University and was medical superintendent of a great asylum, interwoven with his analysis of mental hygiene in Man went his studies of the ant and the bee.

As a politician and social worker Forel felt that Mankind might well imitate on a higher plane the social systems of the ant and bee. He looked forward to the establishment of a "super national human formicary" (ant-hill, from Latin *formica*, ant), a world organization which ants have not the imagination or strength to build but the road to which they can point out to us.

But if the ants can teach us much in the way of selflessness and organization for the good of the community, they lack the one thing that makes life worth living — progress. An ant-city represents civilization without progress. Thus Forel was led to work for all far seeing, forward-reaching motives, of which eugenics, to his mind, was one of the most promising.

Forel's work was not restricted to the philosophical or political or social interpretation of the ant community.

In order to interpret, one must first ascertain the true facts, and from the age of five he used to watch the mysteries of ant life. He made brilliant discoveries concerning the senses of smell, sight, hearing, etc., in social insects, detailed in his "The Senses of Insects."

Forel's most important published work on entomology was his book, the result of the labours of 75 years, "The Social World of the Ants." He died July 27, 1931.



**AUGUST FOREL**

This great French psychologist analysed not only the working of the human mind, but also the working of the brains of the social insects, ants and bees.

## WEALTH & BEAUTY of OUR FORESTS

*With the aid of modern inventions and chemical discoveries, trees can be made to yield almost everything to satisfy Man's needs—from silk stockings to chocolates. How invaluable, then, our forests are!*

**Forests.** The forest is one of Man's most useful servants. Not only does it preserve the earth's moisture, regulate the flow of streams, moderate the winds and temperature, it also supplies Man with wood and wood products, without which he could make little progress.



Courtesy Canadian National Rlys

In their relation to climate the forests may be considered great natural reservoirs, which accumulate the rainfall in the thick covering of decaying humus beneath the trees, while the heavy foliage, shutting out the sun, prevents

evaporation. It is interesting to note that the very word "forest" comes from a Latin word

(*foris*) which means "out of doors," and suggests something of the vastness and charm of Nature's wonder growths.

There are three main types of forests, one, typical of cold regions, composed chiefly of conifers or evergreen (needle leaf) trees, the second, in temperate zones, made up almost entirely of deciduous or "hardwood" (broad leaf) species, while the third consists of evergreen hardwood trees of the tropical rain-forests.

The wooded area of Russia, one of the largest forest regions in the world, covers most of the north and middle portions of the country. This area consists either of forest region proper or of prairies with forests scattered over them. The trees in the northern section are coniferous, those found elsewhere are deciduous, although the two species occur in places. Birch, oak, pine, larch, cedar, ash, beech, silver fir, lime, and willow are among the trees that flourish.

The forests of the United States, Central America, and Brazil are of great value to Man.



## FORESTS



### ENGLISH FOREST FIRES

In hot summers forest fires in England can be a serious danger, for they may threaten buildings on their borders. In the photograph above men are beating out a fire in the New Forest. On the right is a fire observation post in the Forest of Dean, in Gloucestershire.

The forest area of Canada, the largest in the world, and the wealthiest, covers about 900,000 square miles. The trees include the poplar, birch, pine, spruce, beech, oak, maple, ash, and Douglas fir.

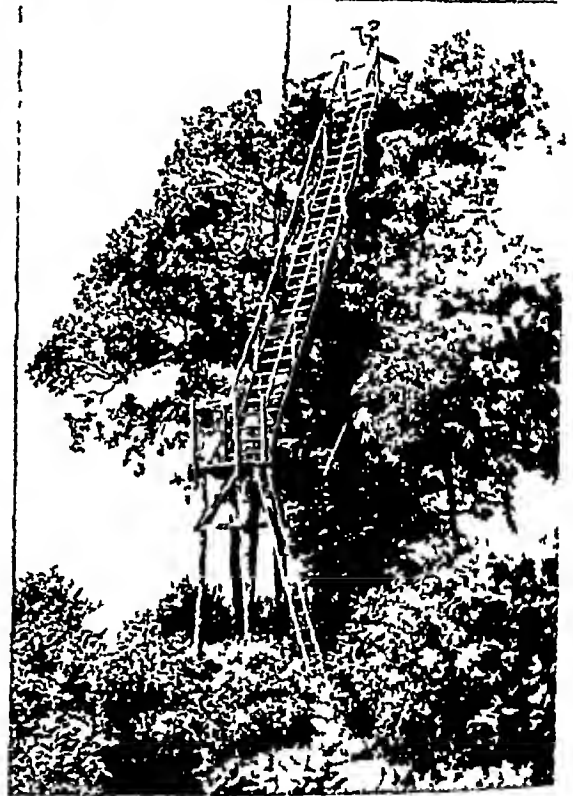
Europe has much coniferous forest in the north and on the mountains, but typical mixed deciduous woodland, with oak, beech, and ash, everywhere else.

The life of a forest is very interesting. Each tree must continually fight for its right to live, for on every side are other trees crowding and groping outward and upward for the light and air which, together with the moisture taken from the earth, are necessary to its development. Tall trees are continually sending out new branches in search of light, the lower branches dying as the higher foliage shuts out the light and air. This accounts for the bareness of the trunks of forest trees, the dead limbs having been shed in the process of growth. The evergreens, with their conical tops, grow closely together, for the light falls on their tops from all angles and therefore they do not need much space. The hardwoods in the forest grow farther apart, for their broad tops require more room in which to spread. The forester plants trees close together, to force them to grow high with the long trunks which are the best for timber.

Of all the foes that attack the woodlands forest fires are the worst. They spring from many sources, sometimes being started by flying sparks from a locomotive, by the dropping of a lighted match, or by a flash of lightning. Settlers clearing their land often start in the dry leaves fires which sweep for mile after mile,

destroying the young growth and injuring the larger trees.

At times forests have been deliberately fired by sheep owners in order to extend the area of pastures. Reckless lumbering is the next worst enemy of the forest, for, through carelessness in felling the timber, many fine young trees are knocked down with the mature ones. Floods are another source of destruction, rapidly washing the



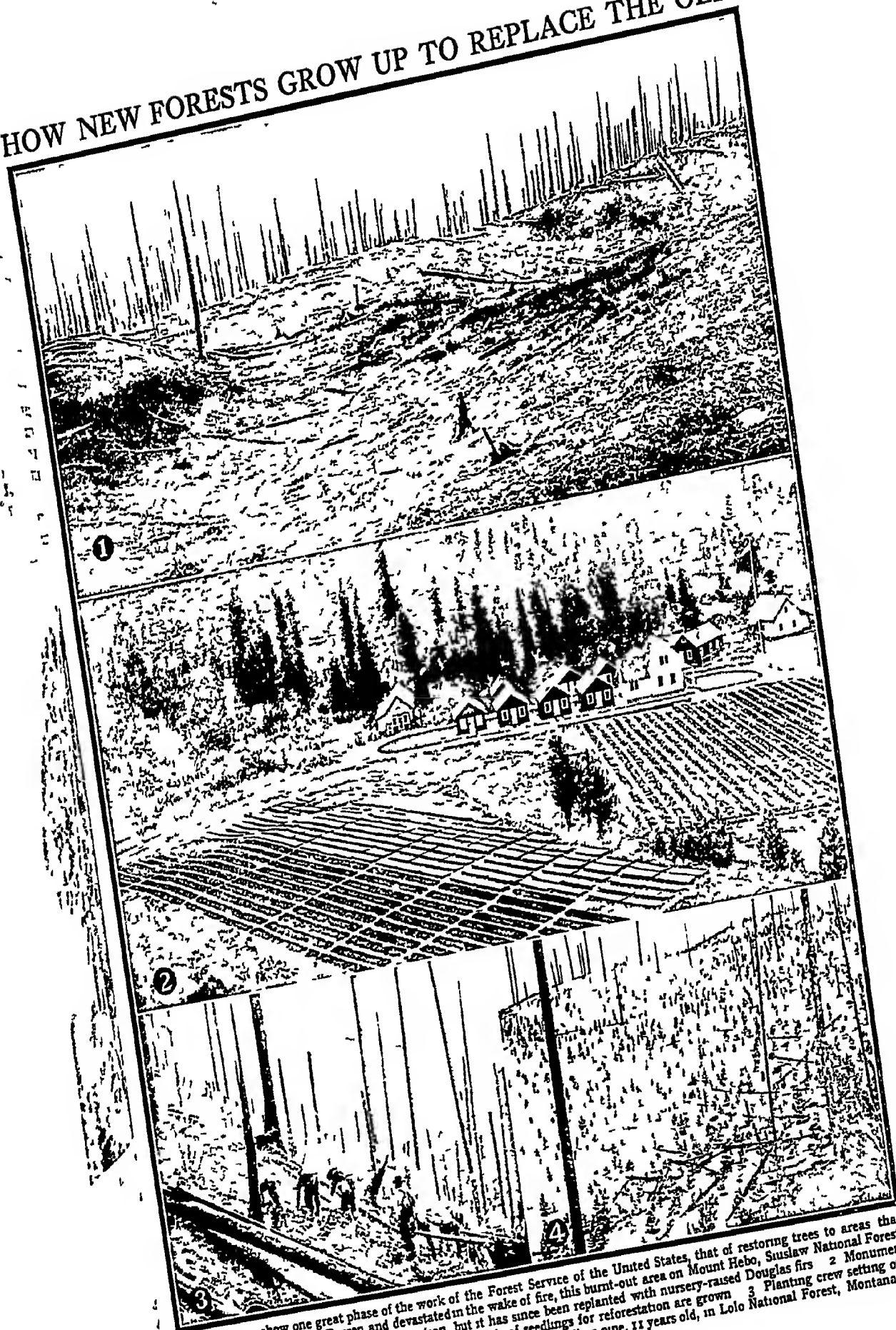
soil away and leaving bare rock where once was woodland.

Wind storms, especially in the tropics and in the United States, also do a great deal of damage, often felling a wide path of giant trees, splintering the trunks and making them useless for lumber, and piling up material for future forest fires. And all the time insects are attacking the woodlands, whole regions becoming infested with the pests, which eat away the leaves or bore into the trunks, destroying old and young alike. Fungi are also very destructive.

Long ago governments began to recognize the vast national importance of the forests,



# HOW NEW FORESTS GROW UP TO REPLACE THE OLD



These pictures show one great phase of the work of the Forest Service of the United States, that of restoring trees to areas that have been deforested. 1 Barren and devastated area on Mount Hebo, Siuslaw National Forest, Oregon, where thousands of seedlings for reforestation are grown. 2 Nursery, Pike National Forest, Colorado. 3 Planting crew setting out seedlings in the St. Joe National Forest, Idaho. 4 Plantation of yellow pine, 11 years old, in Lolo National Forest, Montana.



**GUARDING AUSTRALIA'S FORESTS** For

Australia's great forests are protected against fire by an elaborate government organization. The photograph shows a forest ranger with a portable wireless set, receiving from a government aeroplane reports of a fire's extent and position.

and steps were taken to prevent their ruthless destruction and to promote reforestation. Throughout Europe, especially in Germany, forestry or forest protection and cultivation, has been reduced to a science. In the British Empire alone more than 580 minor products of forests in 36 countries were listed in 1936.

The dreary Sahara was not always a desert. Early Egyptian records allude to the herds of buffalo that roamed a forested region now the centre of the Sahara. The remains of trees growing along vanished rivers and dried-up lakes are still in evidence. When the Arabs settled in that part of Africa, they cleared the forests, raised some crops, pastured vast herds of goats, and moved on incessantly. Ruined forests were left, and shifting sands completed the wreckage.

China once had a rich forest covering, but the trees were cut down with a prodigal hand. Fires destroyed the remaining vegetation. Then the heavy rains which swept over the land washed away the fertile top soil, no longer held in place by forest covering, carried it into

streams and out into the ocean. Millions of acres of barren waste, where nothing grows, replaced the priceless forests and the fruitful soil.

In the United States the supply of timber was apparently so inexhaustible that almost no steps were taken to prevent reckless lumbering until the latter part of the 19th century, when Congress granted the President the right to create forest reserves, or national forests. In all these reserves Nature is aided in every way in order that an abundant yield of lumber may be obtained every year. The vast forests of North America are cared for by forest rangers—trained men employed by the government to guard and protect the forest. In the swaying top of a tall tree, or in a look-out station on the top of a commanding hill, you might perhaps see a man intently scanning the surrounding woods through field-glasses. Should he see the tell-tale smoke of a forest fire eating its way through the timber, he immediately spreads the alarm by telephone to other stations. Help is rushed to the threatened point, and the fire is prevented from spreading, though not always before some damage has been done. Insect pests, too, are dealt with in an efficient manner, often with the co-operation of experts from other countries.

## Forestry in Britain

It must be admitted that in almost every respect we in Britain lag far behind other countries in our forestry. This is partly because there is no national control over our forests and woodlands, and everlasting controversy exists between the Forestry Commission, the official Government department which controls those woodlands that are owned by the State, and the numerous private landowners who possess woodlands. The policy of the Forestry Commission, in planting conifers in order to give a quick yield, is attacked on the grounds that these trees are not native or natural to Britain. The reply is that to grow hardwoods, such as oak and beech, takes a very long time and no crop can be expected for a hundred years or so. In former times, oak was grown widely because it was essential for the navy, but when steel replaced oak in shipbuilding forestry fell into complete neglect, and it is only quite recently that we have really been advancing in this important science. During the World War of 1914-1918 great quantities of timber were cut down in Britain for industrial uses. The present policy is to make good these wartime losses.

The Forestry Commission trains its foresters very fully in theory and practice, and they work in the various State forests all over the country. There are also schools of forestry at the universities, where one may train for the higher grades of the science. The forestry services of India, Malaya and Australia are largely recruited from British universities. There entomologists,

botanists and mycologists all work to help the professional foresters to fight the various natural pests of the woodlands. The Commission, too, advises, and makes grants to, individuals who wish to afforest their own lands.

**Forget-Me-Not.** A curious muddle exists over this little flower, for the name is sometimes given to the germander speedwell (*Veronica chamaedrys*). But the true forget me not is the blue and-yellow *Myosotis palustris*, a



E. J. Bedford

#### THE REAL FORGET ME NOT

Many flowers of the same type are called 'forget-me-not' but the only one that correctly bears this name is *Myosotis palustris*, a common plant growing in watery places. The flowers are bright blue, with yellow centres.

plant of the ditches and streams, with lush green leaves and numerous blooms. The garden "forget-me not" is another species, and should not really bear this name, to be accurate, we should call it a scorpion grass, the name for all the genus except *M. palustris*.

The forget-me not is met with everywhere in the British Isles. It begins to blossom in June, and continues to flower until the autumn.

**Formo'sa.** In 1590 some Portuguese traders were sailing off the coast of China when they sighted an island whose wondrous beauty struck them so forcibly that they cried out, "Ilha Formosa! Ilha Formosa!" (Beautiful Island). A few years later the word "Formosa" appeared on the charts of Dutch navigators, and at last became the accepted name of this semi-tropical island. The Japanese, to whom it was ceded by China in 1895, call it Taiwan.

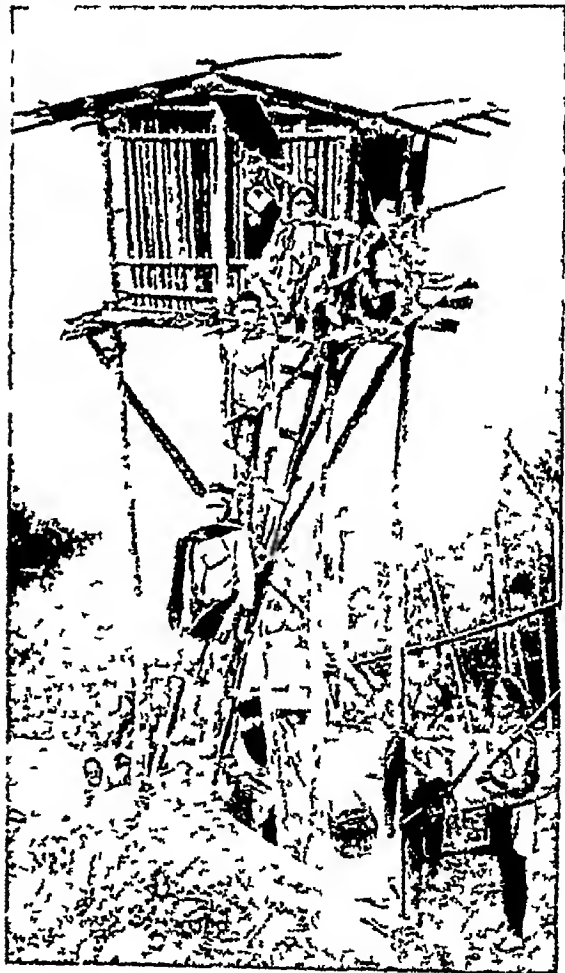
The beauty of the island contrasts strangely with the savagery of the native inhabitants, who made the name Formosa terrible in the ears of sailors for many generations. For these muscular, broad chested savages, with their huge hands and feet, large mouths, and broad flat

noses, were cannibals and head-hunters, and until recently any unfortunate mariner cast away on the coast in the terrible storms (typhoons) that sweep the China Sea, could expect no better fate than death. Missionaries have done good work in educating these natives.

On the world map Formosa seems a small oblong patch off the east coast of China. In reality it is 235 miles long and 90 miles wide, its area is nearly 14,000 square miles. Nutaka-Yama, called by Europeans Mount Morrison (over 14,000 feet), is the highest peak in the Japanese Empire.

The island is rich in plant life. Wild flowers bloom all the year round, many of them beautiful varieties of lilies, orchids, azaleas, rhododendrons, and other flowers, which are commonly known elsewhere only as hothouse plants. In the southern districts grow such tropical fruits as the pomegranate, bread fruit, figs, guava, and oranges.

Tiger cats, Tibetan bears, deer, civets, wild boars, apes, armadillos and squirrels abound. In all parts are found venomous snakes. One of



#### FORMOSAN WATCH TOWER

The Formosans were a wild and lawless people before they were governed by Japan. In the old days a look-out like this would have been used to watch for enemies, but this flimsy perch is now used only by hunters watching for game.

the most beautiful of the many birds is the blue magpie, with its black head and neck, vermilion bill and legs, and blue and white body. The most important domestic animal is the water buffalo, which long ago was brought in from China as a beast of burden.

Farming is the chief occupation, and the principal products are rice, tea, sugar, sweet potatoes, jute. In the eastern part are forests of camphor trees, which give Japan a virtual control of the world's supply of natural camphor. There are also great forests of hardwood timber as yet almost untouched. Gold, silver, copper, sulphur, and coal are mined in considerable quantities.

With the adjoining group of about 50 islands, Formosa forms a province of the Japanese Empire. Taihoku (population about 280,000) is the capital. There are over 600 miles of public railways and nearly 1,500 miles of private lines.

A university was opened in 1928. The population is just over 5,212,000, chiefly Japanese and Chinese.

**Fortuna.** The goddess of Fortune was worshipped in Italy as Fortuna, and in Greece as Tyche. In Italy her worship was of very ancient origin, it did not start at Rome. In Latium there were two famous shrines of Fortuna—at Praeneste and at Antium. It seems probable that the Italian Fortuna was

not so much a goddess of chance in general, as a deity to be invoked by men and women on particular occasions of crisis or danger, and also by groups of people, and as such she had special epithets attached to her name, thus Fortuna Equestris presided over the fortunes of the equestrian order. As time went on, the Italian Fortuna grew more and more like the Greek Tyche, and her help came to be invoked throughout the Roman Empire at every hour of the day and night, whenever her supposed powers were needed. On coins and in statues, Fortuna is represented with a cornucopia (horn of plenty), as the giver of prosperity, with a rudder, as the controller of destinies, with a wheel or a globe, to indicate the revolutions of chance, or the world as subject to chance, and sometimes with wings.

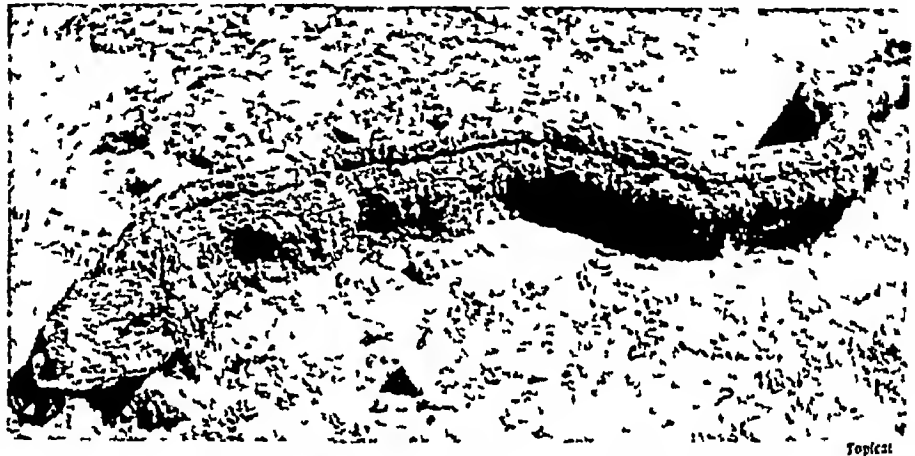
**Fossils.** These are the remains of animals and plants, buried millions of years ago and turned to stone by chemical processes in the

rocks—the bones of huge monsters, the trunks of ancient trees, the moulded forms of huge insects, of queer fishes and shells, of birds with teeth, of real sea serpents, of hundreds of other relics of bygone ages. Not all these things would be found in any one place, but all such things have been found in places very widely distributed over the earth.

This word, "fossil," comes from the Latin word meaning "to dig," and by the study of fossils scientists have been able to piece together some of the most important pages in the history of the earth and its inhabitants.

From fossils we have learned that the ancestors of the elephant once roamed over Britain, that tropical forests once covered Europe and the United States, and that a luxuriant vegetation grew where now are the Polar regions with their snow and ice.

Fossils tell us that the great coal and chalk



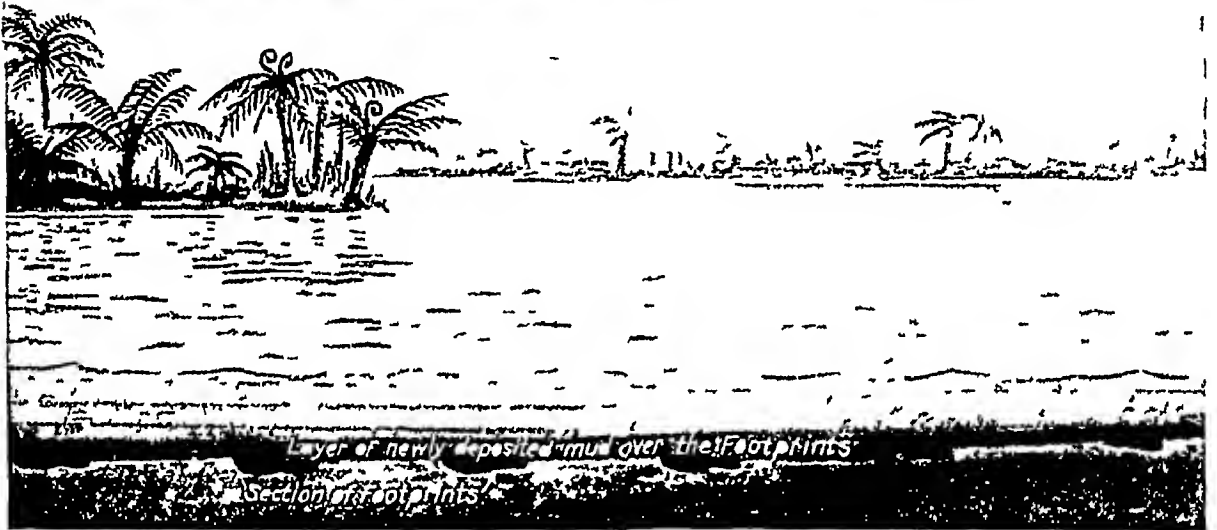
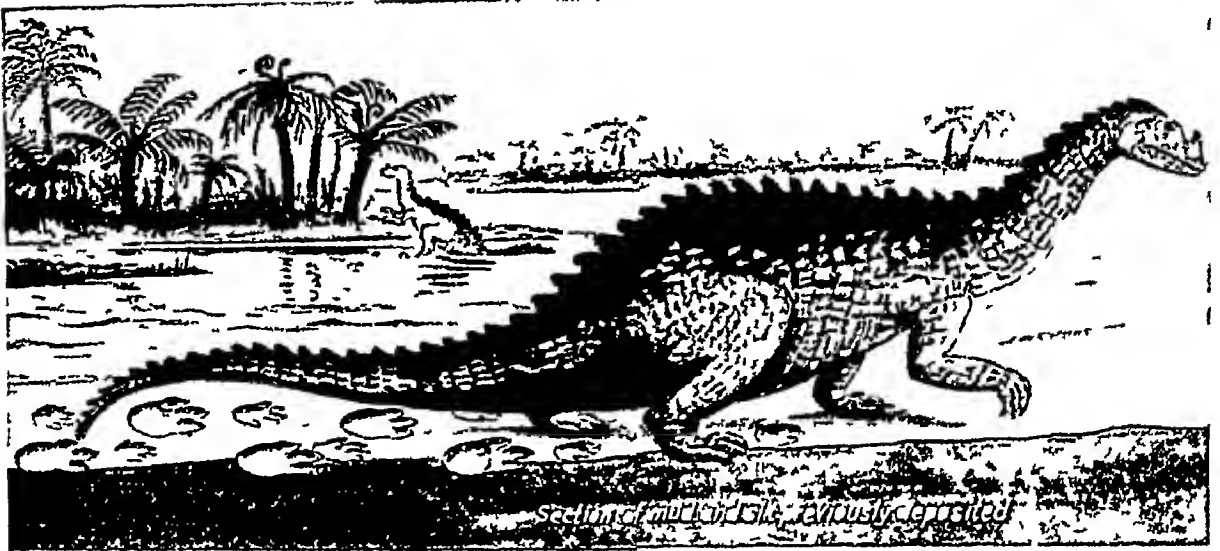
PERFECT FOSSIL DUG UP IN AMERICA

This is an unusual example of a fossil, for it is seldom that anything so complete is unearthed. It is a petrified snake from South Dakota in the United States. It was found with other fossilized reptiles on a hillside, they were thought at first to be only unusual earth formations.

beds of the world were formed from the remains of living things, and that millions of years before the pyramids of Egypt were dreamed of, tiny animals were making shells which became the limestone of which parts of those pyramids are built.

Fitting together the scattered parts of the fossil story, science has traced animal life back to the earliest worms and shell fish, and has shown how, one after another, there appeared the higher invertebrates, the cartilaginous fishes like sharks, the amphibians (half land, half-water animals like the frog), the reptiles, the birds and bony fishes, the mammals and, last of all, Man.

Fossil plants and fossil animals are found in many forms. In some cases a fossil is only the footprint of some prehistoric beast in the mud of bygone ages, which has been buried and preserved under a fresh layer of sand or silt. Or it is the delicate imprint of a leaf on some



### TRACKS OF ANCIENT MONSTERS IN THE ROCKS

In far-off Jurassic times the climate of North America was moist and hot, and what is now prairie land was a swampy wilderness filled with soft marsh-vegetation and fernlike trees. Through these forests and round the marshes roamed great reptiles like the dinosaur in the picture. Most of the footprints they left in the mud were washed out, but occasionally the mud hardened, and then was overlaid with mud of another kind which did not unite with the lower layer. As time went on and more mud was deposited, its weight hardened the lower layers into rock and thus the footprints were preserved.

soft material which later hardened into solid rock. Sometimes the body of an animal was buried and decayed, leaving a hollow mould which filled up with mineral matter forming a cast of the animal's shape. Sometimes the bones and teeth themselves have survived in a favourable spot. In a few relatively recent cases even the flesh of the creature has been preserved, as for example the mammoths embedded in the frozen mud cliffs of Siberia for thousands of years, whose meat was so fresh that it has been eaten by modern Man.

The science of fossils is called Palaeontology, and to understand fully its importance you should read the articles on Evolution and Geology. Many strange relationships have been made known, based upon the fossils of

some of the animals which came into existence in the early days of the world's history, and the more such fossils are examined, the better idea we get of the steps by which animals and plants have evolved.

The strangest of all creatures to have been dug up out of the earth as fossils are the giant monsters of the Reptile Age—the dinosaurs, the ichthyosaurs, etc. (See Prehistoric Animals). Some of these primeval reptiles were nearly 100 feet long, and some were perhaps the largest animals that ever lived. The farther back we go the smaller is the proportion of brain space in the animal's skull. The latest fossil remains are those of early Man. (See Cave Dwellers).

One of the most widely distributed of the fossil families is the trilobites, ancient crab-like



animals whose horny helmets and back-shields are found in ancient rock formations in nearly all parts of the world. Once the prevailing form of marine animal, they died out in the changes and biological struggles through which the earth has passed. The king crab of the present day is considered to be probably the descendant of the trilobite stock.

Fossils are found in nearly all the countries of the world. There is a very unusual type of fossil bed near Los Angeles, California, U.S.A., consisting of asphalt deposits, which were once soft and sticky and, probably, covered with water. Animals coming to drink were stuck in the asphalt, much as sticky paper catches flies. Great numbers of prehistoric skeletons have been dug out of these dried-up pools.

There is, too, an important practical use for fossils since by them a geologist can tell what

type of rock he is examining, and hence what minerals, oil or coal he is likely to find therein.

**Fox.** The boldness and cunning of the fox (*Vulpes vulpes*) have long been acknowledged by Man, and celebrated by him in innumerable folk-tales. It is, of course, now famous with us as the most hunted of all creatures—kept alive, in fact, only to be hunted!

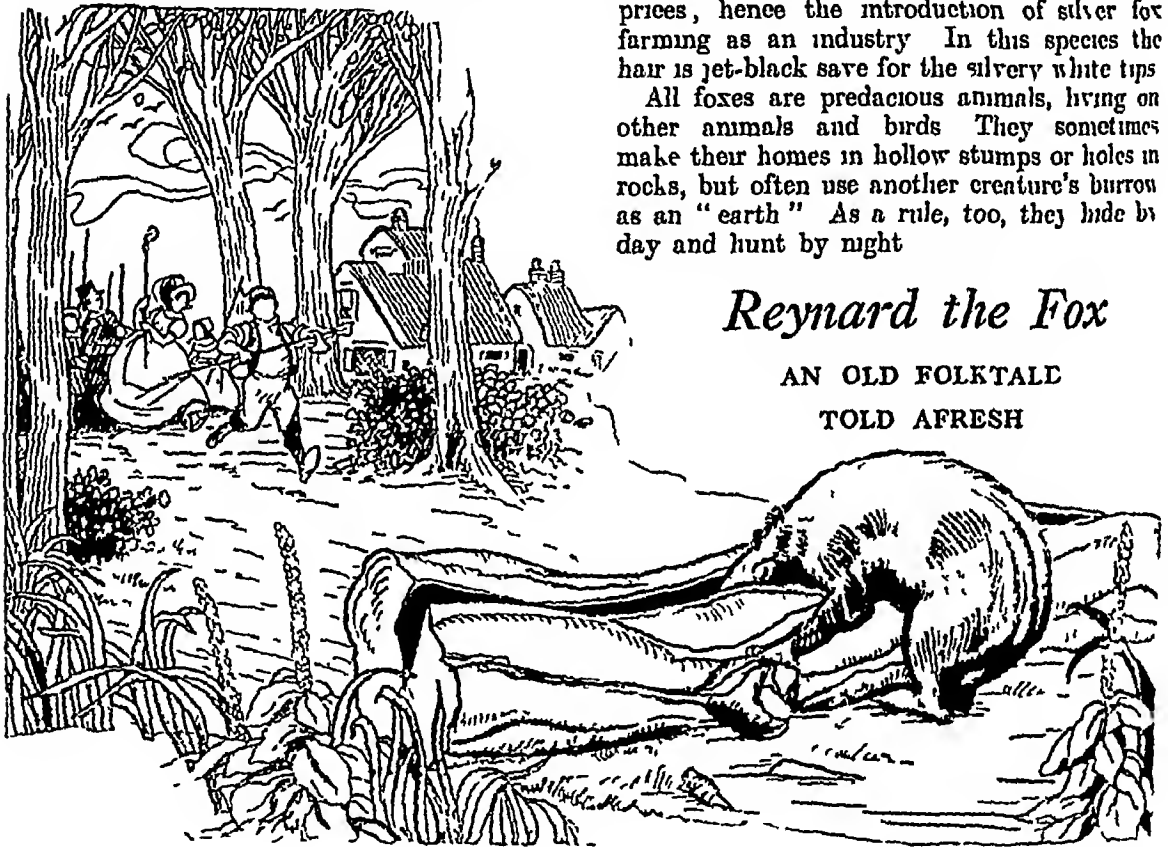
The fox is closely related to the dog and jackal, but is distinguished by the sharp muzzle, erect ears, elliptical pupil of the eye and long bushy tail. There are several kinds, common in different parts of the world with the exception of South America and Australia.

The Arctic fox, which ranges southward to Labrador and Newfoundland, has beautiful silky fur, bluish or brown in summer and pure white in winter. The silver fox holds first place among fur-bearers and its skin sells for enormous prices, hence the introduction of silver fox farming as an industry. In this species the hair is jet-black save for the silvery white tips.

All foxes are predacious animals, living on other animals and birds. They sometimes make their homes in hollow stumps or holes in rocks, but often use another creature's burrow as an "earth." As a rule, too, they hide by day and hunt by night.

## Reynard the Fox

AN OLD FOLKTALE  
TOLD AFRESH



"LONG, long ago," as the story-books say, "when animals could talk just like people"—by which, of course, we mean the time when primitive folk were so imaginative that they pictured animals talking and acting like human beings and even gave them names—there first arose this tale which grew into the great folktale of "Reynard the Fox."

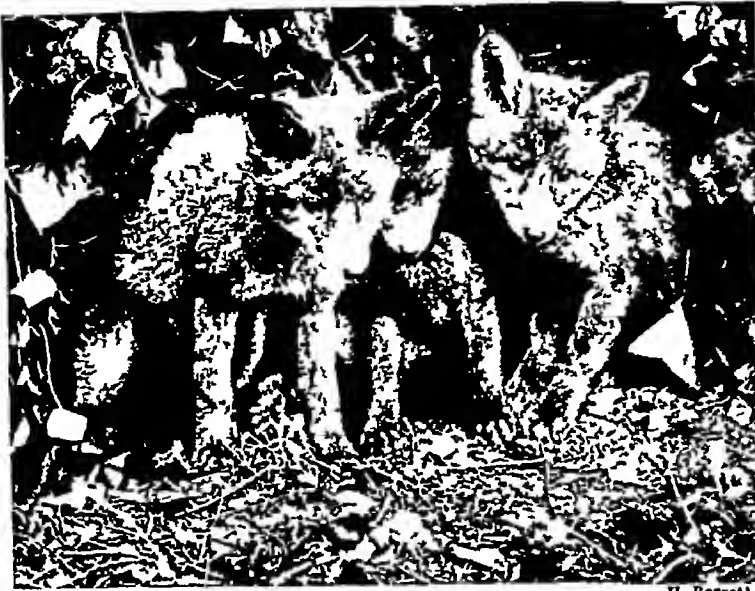
In its completed form the poem tells how Reynard—whose name means "strong in counsel"—was summoned at different times, because of his misdeeds, to appear before

Noble the Lion, King of the Beasts, to answer charges brought against him by Isengrim the Wolf, Bruin the Bear, Chanticleer the Cock and other creatures whom he had often wronged and how each time Reynard's sharp wit saved him from punishment.

Once, when his uncle Bruin, as the strongest of the beasts, was sent to fetch him into court Reynard bethought him of a way of escape. He complained that he was feeling ill from having eaten of a strange new fare—honeycombs.

"Ha!" cried Bruin. "Honeycombs? What,





FOX CUBS' FIRST OUTING

H. Barrett

Here are three really jolly little fox cubs, just taking a preliminary peep from the mouth of their "earth," and wondering what it will be like in the world outside. They are very like puppies as you can see, and, as a matter of fact, if you caught these three and reared them, they would live peaceably even with fox-hounds!

it is meat for the greatest emperor in the world. Fair nephew, help me to some of that honey, and I will be your servant everlastingly."

So Reynard promised to lead his kinsman to a place where he could find as much honey as he could eat. Now the fox had noticed that a certain carpenter had brought into his yard a great hollow oak log, which he had begun to cleave and into which he had struck two wedges in such a way that the cleft stood a great way open. To this log Reynard led Bruin, saying:

"Behold now, dear uncle, within this tree is so much honey that it is immeasurable. Try if you can get into it, good uncle, but eat moderately, for albeit the combs are sweet and good, yet too much is dangerous and may be troublesome to your body."

When greedy Bruin thrust his head into the cleft, Reynard pulled out the wedges, so that the bear was locked fast in the log. Leaving his poor victim struggling in vain to free himself, Reynard started on his homeward way, but stopped to call out mockingly from afar:

"Is the honey good, uncle, which you eat? Eat not too much, I beseech you. Pleasant things are apt to surfeit."

Bruin howled and roared, scratched and tumbled about. He ended by making such a noise that the carpenter came out to see what was the matter, and was followed by all the neighbours. Soon all the parish was there, and Bruin was thrown into a terrible fear by this great army that had come against him. He wrestled and pulled so hard that presently he got his head out, but he left behind him part

of his skin, his ears, and his claws. He could hardly see or move, and was in sore distress.

Then all the people added to his torment by beating him with weapons of every sort. The carpenter threw stones, others belaboured him with rakes, brooms, distaffs, or whatever they happened to pick up. At last poor Bruin, hardly knowing what he was about, leaped into the river, and by the merest chance escaped.

Reynard, in the meantime, had gone gaily on his way. Many more attempts were made before he was finally brought to trial, and so great was his cunning that even then he escaped the penalties which he richly deserved.

"Reynard the Fox" belongs to a class of animal tales found in the folklore of almost all countries.

As to the original home of this poem, it is believed to have originated in the borderland between France and Flanders, far back in medieval times.

**Fractions.** This word comes from a Latin verb meaning to break. A fraction of any substance is really a part broken off from the whole, so in arithmetic, when we talk about fractions, we are really finding out all about the size of these broken parts, how we can build them together or break them down into still smaller pieces.

If we fold a square sheet of paper (Fig 1, A) so as to bring the ends together, the crease made by the folding will divide the paper into two equal parts or *halves*, as in B.

If we open the sheet, spread it out and fold the ends to the middle crease, the paper will be divided by the three creases into four equal parts or *fourths*, (C).

By opening the paper and folding it crosswise so that one side lies upon the other, we shall divide it into *eighths* (D).

By opening the paper and folding each side to the vertical crease, we shall divide it into *sixteenths* (E).

These parts—halves, fourths, etc.—are called *fractions*. They are measures or ratios of quantity and do not depend upon measuring.

#### Halves

- 1 How many halves in 1? (See Fig 1, B)
  - 2 What is  $\frac{1}{2}$  of 3?  $\frac{1}{2}$  of 5?  $\frac{1}{2}$  of 7?  $\frac{1}{2}$  of 9?
- Draw lines 3 inches long, 5 inches long, etc. Halve each measure, and you have the answers.



A



B



C



D



E

Fig 1

# FRACTIONS

3 Add  $2\frac{1}{2}$   $3\frac{1}{2}$   $4\frac{1}{2}$   $3\frac{1}{2}$   $6\frac{1}{2}$   $6$

4 Subtract  $7$   $9$   $8$   $12$   $9\frac{1}{2}$   $18\frac{1}{2}$

To solve  $7 - 3\frac{1}{2}$ , draw a line 7 inches long Cut off  $3\frac{1}{2}$  inches How much is left?

## Fourths

Cut out pieces of paper like those shown in Fig 2, (a) 4 inches square, (b) 2 inches by 4 inches, (c) 2 inches by 2 inches, (d) irregular form 4 inches by 4 inches on the long sides, (e) 4 inches square, creased into fourths Write the fraction name on each form

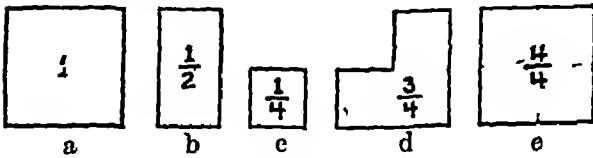


Fig 2

1 Compare  $\frac{1}{4}$  with two of the  $\frac{1}{4}$  forms put end to end,  $\frac{3}{4}$  with three of the  $\frac{1}{4}$  forms, 1 with 4 What do you find? They are the same sizes

2 Study the picture problems in Fig 3 Place  $\frac{1}{4}$  and  $\frac{1}{2}$  together Which fraction could be covered by their sum? Place  $\frac{1}{4}$  and  $\frac{3}{4}$  together Which form does their sum equal? Place two of the  $\frac{3}{4}$  forms together What fraction must be added to 1 to equal their sum?

$$\frac{1}{4} + \frac{1}{2} = \frac{3}{4}$$

$$\frac{1}{4} + \frac{3}{4} = 1$$

$$\frac{3}{4} + \frac{3}{4} = 1\frac{1}{2}$$

Fig 3

5 Add  $8\frac{1}{4}$   $4\frac{1}{4}$   $7\frac{1}{4}$   $3\frac{1}{4}$   $6\frac{1}{4}$   $5$   $6\frac{1}{4}$

6 Place  $\frac{3}{4}$  on 1 Which other unit added to  $\frac{3}{4}$  will cover the 1? Then  $1 - \frac{3}{4} =$  what?

7 Place  $\frac{1}{4}$  on 1 How much added to  $\frac{1}{4}$  will equal 1? Then  $1 - \frac{1}{4} =$  what?

8 Subtract  $7\frac{1}{4}$   $13\frac{1}{4}$   $6$   $8\frac{1}{4}$   $6\frac{1}{4}$   $10$

Draw a line  $7\frac{1}{4}$  inches long Cut off  $6\frac{1}{4}$  inches How much is left? Measure

## Eighths

Cut pieces of paper like the shapes in Fig 4 Let the 1 be 4 inches by 4 inches, the  $\frac{1}{2}$ , 2 inches by 4, etc

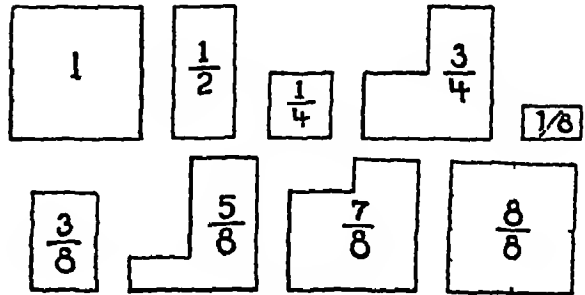


Fig 4

Make sums and differences as in the exercises with fourths

1 Which fraction equals  $\frac{1}{2}$ ? Which one equals  $\frac{3}{8}$ ? Which equals  $\frac{5}{8}$ ? Changing  $\frac{1}{2}$  to  $\frac{4}{8}$  or  $\frac{5}{8}$  to  $\frac{5}{8}$  is called *reducing to lowest terms*

2 Add  $4\frac{1}{8}$   $7\frac{1}{8}$   $2\frac{1}{8}$   $9\frac{1}{8}$   $6\frac{1}{8}$   $5\frac{1}{8}$   $7\frac{1}{8}$   $4\frac{1}{8}$

Verify the results by drawing lines  $4\frac{1}{8}$  inches and  $2\frac{1}{8}$  inches long, end to end, and measuring, and so with the remaining examples

3 Add  $2\frac{1}{4}$   $7$   $6\frac{1}{8}$   $5\frac{1}{4}$   $4\frac{1}{4}$   $6\frac{1}{8}$   $7\frac{1}{8}$   $6\frac{1}{4}$

4 Subtract  $11\frac{1}{4}$   $12\frac{3}{4}$   $12\frac{1}{4}$   $5\frac{5}{8}$   $9\frac{1}{4}$   $7\frac{7}{8}$   $13$

5 Which form equals  $\frac{5}{8}$  of  $\frac{3}{4}$ ? Find one that covers  $\frac{5}{8}$  of  $\frac{3}{4}$  Then  $\frac{5}{8} \times \frac{3}{4} =$ ? (Read the sign  $\times$  as "of")

6 Add  $3\frac{5}{8}$   $4\frac{5}{8}$   $5\frac{5}{8}$   $2\frac{5}{8}$   $9\frac{5}{8}$

In solving these problems notice that

$$1\frac{5}{8} = \frac{13}{8} = 1\frac{5}{8}, \frac{1}{8} = \frac{1}{8}, \frac{1}{8} = \frac{1}{8} = 1\frac{1}{8}$$

## Thirds

Cut forms of paper like those in Fig 5 Let the  $\frac{1}{3}$  be 3 inches square Write the fraction names upon the forms

Add  $3\frac{1}{3}$   $6\frac{2}{3}$   $7$   $6\frac{2}{3}$   $8$

Subtract  $6\frac{2}{3}$   $7\frac{1}{3}$   $8$   $8$   $4\frac{1}{3}$

To solve  $8$  minus  $2\frac{2}{3}$  use the *additive method* (as in giving change) Think  $\frac{2}{3}$  added to  $2\frac{2}{3}$  makes 3, and 5 more makes 8 We added  $5\frac{2}{3}$  so  $8$  minus  $2\frac{2}{3} = 5\frac{2}{3}$  To solve  $4\frac{1}{3} - 2\frac{2}{3}$ , think how much must be added to  $2\frac{2}{3}$  to make  $4\frac{1}{3}$  Thus  $\frac{1}{3}$  more makes 3, 1 more makes 4, and  $\frac{1}{3}$  more makes  $4\frac{1}{3}$  We added  $1\frac{1}{3}$ , so  $4\frac{1}{3} - 2\frac{2}{3} = 1\frac{1}{3}$

Fig 5

## FRACTIONS

### Sixths

Cut forms as in Fig 6, making the  $\frac{1}{6}$  either 3 inches or 6 inches square. Write the fraction names upon the forms.

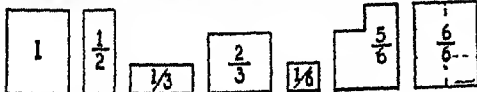


Fig 6

- 1 Make sums by placing any two forms together.  
*Example*  $\frac{1}{6} + \frac{1}{6} = \frac{2}{6}$
- 2 Observe the forms and answer. What fraction equals  $\frac{1}{3}$ ?  $\frac{2}{6}$
- 3 Place  $\frac{1}{6}$  on  $\frac{1}{3}$  and tell what part of the  $\frac{1}{3}$  is covered. What part of  $\frac{1}{3} = \frac{1}{2}$
- 4 Lay the form  $\frac{1}{6}$  on the form  $\frac{1}{2}$  on  $\frac{1}{3}$  on  $\frac{1}{6}$  on  $\frac{1}{6}$ . How many sixths remain uncovered in each case? Change the remainder to lowest terms in each case.
- 5 Lay the form  $\frac{1}{6}$  on the form  $\frac{2}{3}$  on  $\frac{1}{3}$  on  $\frac{1}{6}$  on  $\frac{1}{6}$ . How many sixths are left uncovered in each case?
- 6 Show  $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ .  $\frac{1}{3} + \frac{1}{6} = \frac{1}{2}$ .  $\frac{1}{6} + \frac{1}{6} = \frac{1}{3}$ . Reduce  $\frac{5}{6}$  to a mixed number. Reduce  $\frac{1}{2}$  and  $\frac{1}{3}$  to lowest terms and then to mixed numbers.
- 7 Show  $\frac{1}{2} - \frac{1}{3} = \frac{1}{6}$  by laying the form  $\frac{1}{6}$  on the form  $\frac{1}{2}$ . Which form equals the uncovered part of the  $\frac{1}{2}$ ?
- 8 In the same way show  $\frac{1}{3} - \frac{1}{6} = \frac{1}{6}$ .  $\frac{1}{6} - \frac{1}{6} = 0$ .
- 9 Lay the form  $\frac{1}{6}$  on the form  $\frac{1}{6}$  to find out how many times  $\frac{1}{6}$  contains  $\frac{1}{6}$ . Then  $\frac{1}{6} - \frac{1}{6} = 0$ .  $\frac{1}{6} - \frac{1}{6} = 0$ .  $\frac{1}{6} - \frac{1}{6} = 0$ . Show.

### Twelfths

- 1 Cut a form one-half as large as  $\frac{1}{6}$ . How many such units does 1 contain? Call it  $\frac{1}{12}$ .  $\frac{1}{6}$  of  $\frac{1}{6} = \frac{1}{12}$ .
- 2 Measure the form  $\frac{1}{12}$  using the form  $\frac{1}{12}$  as a measure.  $\frac{1}{12} =$  how many twelfths?
- 3 In the same way change  $\frac{1}{3}$  to twelfths. Change  $\frac{1}{2}$  to twelfths. Lay form  $\frac{1}{12}$  on form  $\frac{1}{3}$ .
- 4 Make a form 3 times as large as  $\frac{1}{12}$ . Apply this  $\frac{1}{12}$  to the 1.  $\frac{1}{12} = \frac{1}{12}$ .  $\frac{1}{12} = \frac{1}{12}$ .
- 5 Change  $\frac{1}{3}$  to  $\frac{4}{12}$ ,  $\frac{1}{6}$  to  $\frac{2}{12}$ ,  $\frac{1}{12}$  to twelfths.
- 6 Write  $\frac{1}{12}$ ,  $\frac{2}{12}$ ,  $\frac{3}{12}$ , etc., in order, to  $\frac{11}{12}$  changing each fraction that can be so reduced to its lowest terms.

### Common Denominators

- 1 Add  $\frac{1}{3}$  and  $\frac{1}{6}$ .
- Solution* Evidently  $\frac{1}{3}$  and  $\frac{1}{6}$  cannot be added until they are reduced to a common denominator. The unit or 1 thought of here must divide into 2 parts to show halves and into 6 parts to show sixths. For convenience draw a form 6 inches long and 2 inches wide. Divide it into halves by a horizontal line and into sixths by vertical lines. Each small division of this form must be  $\frac{1}{6}$ . Why? So tenths is the denominator we seek.  $\frac{1}{3} + \frac{1}{6} = \frac{2}{6} + \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$ . 10 is the common denominator.
- 2 Add  $\frac{1}{3}$  and  $\frac{1}{6}$ .
- Solution* In the figure below (Fig 7) we see that if we measure a 24 inch line with a 6 inch ruler we say 6 12 18 24. If we measure it with a 4 inch ruler we say 4 8 12 16 20 24.

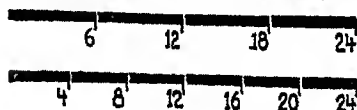


Fig 7

12, 18, 20, 24. 12, 18, and 24 are multiples of 6, 8, 12. 16, 20, 24 are multiples of 4. We notice that 24 is found in both sets of multiples. It is therefore a common multiple of 4 and 6. But we notice that 12 is also a common multiple of 4 and 6 and since it is the smallest possible common multiple of 4 and 6 it is called the *least common multiple* of 4 and 6. 12 is the *least common denominator* desired and twelfths the *least common denominator* of fourths and sixths.

Hence  $\frac{1}{3} + \frac{1}{6} = \frac{2}{6} + \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$ .  
( $\frac{1}{3} = \frac{2}{6}$ ,  $\frac{1}{6} = \frac{1}{6}$ ,  $\frac{2}{6} + \frac{1}{6} = \frac{3}{6}$ ,  $\frac{3}{6} = \frac{1}{2}$ )

3 Subtract  $\frac{1}{3}$  from  $\frac{1}{6}$ .

*Solution* 0, 18, 27, 36, 45, 54 multiples of 9.

0, 12, 18, 24, 30, 36, 42, 48, 54, multiples of 6.  
 $6 \times 9 = 54$ , a common multiple of 6 and 9.

But 18 and 36 are also common multiples of 6 and 9.

Hence 18 is the *least common multiple* wanted.

( $\frac{1}{3} = \frac{2}{6}$ ,  $\frac{1}{6} = \frac{1}{6}$ ,  $\frac{2}{6} - \frac{1}{6} = \frac{1}{6}$ ,  $\frac{1}{6} = \frac{1}{6}$ )

- 4 Find the common denominator of  $\frac{1}{3}$ ,  $\frac{1}{6}$ ,  $\frac{1}{12}$ .  
*Hint* Notice that 8 will exactly divide 16 and 3 will exactly divide 12. What is the least number 12 and 16 will exactly divide?

### REDUCING A MIXED NUMBER TO AN IMPROPER FRACTION

*Example*  $8\frac{1}{2} =$  what?

*Solution* (a)  $1 = \frac{2}{2}$   
(b)  $8 = 8 \times \frac{2}{2} = \frac{16}{2}$   
(c)  $8\frac{1}{2} = 8 \times \frac{2}{2} + \frac{1}{2} = \frac{17}{2}$

### REDUCING AN IMPROPER FRACTION TO A MIXED NUMBER

*Example*  $\frac{17}{2} =$  what?

*Solution*  $\frac{17}{2} = 17 \div 2 = 8\frac{1}{2}$

### Multiplication

- 1  $8 \times \frac{1}{2}$  (8 times 3 fifths) = what?  
*Solution*  $8 \times \frac{1}{2} = \frac{8}{2} = 4$  (Multiply the numerator. Keep the denominator the same.)
- 2 Find  $\frac{1}{2} \times \frac{1}{2}$  (three fourths of two fifths)

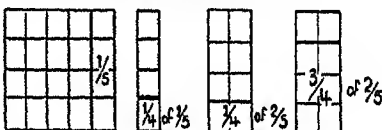


Fig 8

*Solution* Divide a unit (1) into fifths by vertical lines and fourths by horizontal lines (Fig 8). Show  $\frac{1}{2}$ . Divide into 4 equal parts. Show  $\frac{1}{4}$  of  $\frac{1}{5}$ . How many parts each equal to  $\frac{1}{4}$  of  $\frac{1}{5}$  in a whole 1?

(a)  $\frac{1}{2} \times \frac{1}{5} = \frac{1}{10}$  ( $\frac{1}{2}$  of  $\frac{1}{5}$ )

(b)  $\frac{1}{2} \times \frac{2}{5} = \frac{2}{10} = \frac{1}{5}$

(c)  $\frac{3}{4} \times \frac{2}{5} = \frac{6}{20} = \frac{3}{10}$

(d)  $\frac{3}{4} \times \frac{1}{5} = \frac{3}{20}$

(Cancelling the common factor 2 in both numerator and denominator brings the result in its lowest terms.)

3 Find  $\frac{1}{2} \times \frac{1}{2}$

*Solution*  $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

or  $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

(By cancelling the common factors 3 and 2 we can save a step and obtain a result in its lowest terms.)

4 Find  $2\frac{1}{2} \times 6\frac{1}{2}$  ( $2\frac{1}{2}$  times  $6\frac{1}{2}$ )

*Solution*  $2\frac{1}{2} \times 6\frac{1}{2} = \frac{5}{2} \times \frac{13}{2} = \frac{65}{4} = 16\frac{1}{4}$

### Division

- 1 Divide 5 by  $\frac{1}{2}$ .  
*Solution* (a)  $1 - \frac{1}{2} = \frac{1}{2}$  ( $\frac{1}{2} \times \frac{1}{2} = 1$ )  
(b)  $5 - \frac{1}{2} = 5 \times 4 = 20$  (In 5,  $\frac{1}{2}$  is contained 5 times as often as in 1.)

- 2 Divide 5 by  $\frac{1}{3}$ .  
*Solution* (a)  $5 - \frac{1}{3} = 20$   
(b)  $5 - \frac{1}{3} = \frac{1}{3}$  of 20 = 66 ( $\frac{1}{3}$  is contained in any number  $\frac{1}{3}$  as often as  $\frac{1}{3}$  is because it is 3 times as large.)

- (a)  $5 - 1 = 5$   
(b)  $5 - \frac{1}{2} = 4 \times 5$  ( $\frac{1}{2}$  is contained in any number 4 times as often as 1 is.)  
(c)  $5 - \frac{1}{4} = \frac{1}{4}$  of  $4 \times 5 = 20 = 63$

3  $\frac{1}{2} - \frac{1}{3} =$  what?

## FRACTIONS

**Solution**  $1 - \frac{1}{3} = 3 \times \frac{1}{3} = \frac{3}{3} = 2\frac{2}{3}$   
 ( $\frac{1}{3}$  is contained in any fraction number or 3 times as often as 1 is 1 is contained in  $\frac{3}{3}$ ,  $\frac{3}{3}$  of a time, so  $\frac{1}{3}$  is contained in  $\frac{3}{3}$ ,  $3 \times \frac{1}{3}$  times)

$4\frac{1}{3} - \frac{1}{3} = \text{what?}$

**Solution**  $4\frac{1}{3} - \frac{1}{3} = \frac{4}{1} \times \frac{3}{3} = \frac{12}{3} = 1\frac{1}{3}$  (because  $\frac{1}{3}$  is contained  $\frac{1}{3}$  as often as  $\frac{1}{3}$ )

Thus we see that division of fractions is accomplished by inverting the divisor and multiplying

### Adding Mixed Numbers

In adding mixed numbers expand the fractions to a common denominator, add them then add the sum of the fractions to the sum of the integers

**Example**  $12\frac{1}{3} + 21\frac{1}{3} + 8\frac{1}{3}$

Form in Full

$$12\frac{1}{3} = 12\frac{2}{6}$$

$$21\frac{1}{3} = 21\frac{2}{6}$$

$$8\frac{1}{3} = 8\frac{2}{6}$$

$$41\frac{2}{6} = 41 + 1\frac{2}{6} = 42\frac{2}{6} \quad 42\frac{2}{6} = 42\frac{1}{3}$$

Short Form

$$12\frac{1}{3} \quad 8$$

$$21\frac{1}{3} \quad 0$$

$$8\frac{1}{3} \quad 0$$

$$42\frac{2}{6} \quad 1\frac{2}{6} = 1\frac{1}{3}$$

### Subtracting Mixed Numbers

**Example**  $24\frac{1}{3} - 10\frac{1}{3}$

$$24\frac{1}{3}$$

$$10\frac{1}{3}$$

$$13$$

$$1\frac{1}{3}$$

$$13\frac{1}{3}$$

$$13\frac{1}{3}$$

(add  $\frac{1}{3}$  to make the subtrahend 11)

(add 13 to make the subtrahend 21)

(add  $\frac{1}{3}$  to make the subtrahend  $21\frac{1}{3}$ )

total added

### Multiplying Mixed Numbers

To multiply a mixed number by an integer or an integer by a mixed number add the product of the integer and fraction to the product of the two integers

**Example**  $32 \times 2\frac{1}{3}$

$$32$$

$$2\frac{1}{3}$$

$$1 \times 32 = \frac{32}{3} = 10\frac{2}{3}$$

$$2 \times 32 = 64$$

$$70\frac{2}{3}$$

## The PLEASANT LAND of FRANCE

Once Britain's inveterate enemy but now her staunchest ally, and the only other democratic "great power" in Europe, France deserves special study that her problems and outlook may be fully understood

**France.** Situated at the cross roads of western Europe, France is the least isolated of the great nations, and throughout her long and stirring history she has played an important part in world affairs. She is so bounded that she must organize defensive measures for every frontier, land or sea.

To the north-west is Great Britain, to the east Belgium, Germany and Switzerland, to the south Italy and Spain, a bare day's sail separates her from Africa. The sea routes to the Balkans, the Near East and the Suez Canal skirt her southern shores.

Bordering at once on the Mediterranean, the Atlantic, the English Channel and a strip of the North Sea, France belongs equally to southern and northern Europe—to the old era and to the new. When Rome was the centre of the civilized world, Gaul—as France was then called—was a notable part of her empire, and when Venice and Genoa controlled the world's commerce, the French were close at hand.

Then, when the centre of power shifted from south to north through the discoveries in the New World, along the African coast, and in the

**Extent**—North to south about 600 miles, east to west, 400 to 570 miles. Coast-line English Channel, 672 miles, Atlantic, 831 miles, Mediterranean, 369 miles. Area (including Corsica and Alsace-Lorraine), 212,659 square miles. Population, about 42,000,000.

**Physical Features**—Alps (Mont Blanc, 15,780 feet), Pyrenees, Jura and Vosges Mountains, Rhône, Garonne, Loire, Seine, Somme, Meuse, and Moselle rivers, the Rhine now forms part of the eastern boundary. Climate, temperate semi-tropical on south coast.

**Products**—Textiles (cotton, woollen, linen, silk), laces, clothing, objects of art and fashion, coal, machinery, iron and steel, porcelain, glass and chemicals, wines and cider, grains, potatoes, sugar, etc.

**Principal Cities**—Paris (capital, about 2,829,000 population), Marseilles, Lyons (more than 500,000), Bordeaux, Nice, Toulouse, Lille (more than 200,000), Nantes, Strasbourg, St. Etienne, Le Havre, Toulon, Rouen, Nancy, Reims, Roubaix, Clermont-Ferrand (more than 200,000).

**Colonies**—In Asia, Indo-China and French India, in Africa, Algeria (treated as a part of France proper, for most purposes), Tunis, Morocco protectorate, French Equatorial Africa, Madagascar, etc., in America, French Guiana, Martinique, Guadeloupe, various islands in the Pacific (New Caledonia, Tahiti, Marquesas Islands, etc.). Total area of Colonies about 65,000,000 sq. miles. In addition France has a mandate over Syria.

far Pacific—turning men's eyes away from the "middle sea"—France retained the power lost by other Mediterranean lands.

It is only natural that, in a region so open to the world, we should find a varied racial mixture. Traces of several important prehistoric races abound in France, but at the dawn of recorded history most of France was inhabited by the Gauls, a people of Celtic blood.

In the south east, however, lived the Ligurians of the same race as the ancient dwellers in northern Italy, and in the south west the Iberians, probably survivors of a race who had inhabited western Europe before the Celts.

Phoenician merchants settled at a very early date on the Mediterranean coast, and about 600 B.C. Greek traders founded the colony of Massalia (modern Marseilles), and rapidly extended their commerce far into the interior.

Then, in the succeeding centuries, came the Roman conquerors, under whose dominant rule Gaul became Romanized.

The invasion of the Germanic tribes followed—the Visigoths, the Burgundians and the Franks, the last named giving the land their



### FRANCE WASHED BY THREE GREAT SEAS

One of the reasons for the greatness of France is that her coasts are washed by three seas—the Mediterranean the Atlantic and the English Channel—and she has important ports on all three. Instead of the names of the 89 departments 'into which France has been divided since 1791 this map gives the names of the old provinces which have been made famous through centuries of history, and which are still in popular use, particularly in literature. It will be obvious from the map how completely Paris is the centre of the great railway systems of the country.

own name and supplying a dominant influence which was never overthrown. Moors or Saracens from Spain settled for a time north of the Pyrenees and exercised a fleeting rule, and their homes along the English Channel and became in time the Normans.

All these later settlers were more or less absorbed by the original Gallo Roman population, but some of them through intermarriage effected great changes in the customs and physical appearance of the native inhabitants. To these influences must be added those arising from the later immigrations of Italians, Spaniards, Germans, Dutch, and other peoples.

France presents to this day marked differences in the types of her people. In Normandy, for instance, we find the tall, blue eyed, light-haired descendants of the viking Northmen. In the southern provinces—Gascony, Languedoc, and Provence—the short, dark haired pre Celtic type prevails. In Brittany we have people of purest Celtic descent, still speaking a Celtic tongue, while on the north slopes of the Pyrenees live descendants of the ancient Iberians, called the Basques.

Despite these reminders of a varied origin, the people of France today are animated by a spirit of unity unexcelled in any other country. The Gallic "melting pot" has fused the diverse



elements. The glories and disasters of a stirring and eventful history have welded and forged and tempered them into a nation whose power and vitality have more than once astonished the world.

This spirit is made up of strongly contrasting qualities, but on every hand we see hard-headed thrift, typified by the peasant landowner. Generally named "Jacques Bonhomme" ("Goodman Jacques"), in the sense that "John Bull" is named, he is the backbone of the nation, and is so strongly attached to the soil of his forefathers that his kind has never followed the example of other Europeans in emigrating in considerable numbers to foreign lands.

France is shaped roughly like a pentagon or five-sided figure. Its apex lies just beyond Calais on the North Sea, the Pyrenees mountains and the Mediterranean make up the base, the Atlantic and the English Channel form the western and north-western sides, and Belgium, Luxembourg, and part of Germany, and Switzerland and Italy, the north-eastern and eastern sides respectively. The greatest length north to south is about 600 miles, the greatest width about 570 miles. The island of Corsica, which lies more than 100 miles from the mainland coast in the Mediterranean, is an integral part of France, and for most purposes Algeria, a night's sail across that sea, in Africa, is also treated as an equal part of the republic and not as a colony.

The western coast line of France shows two pronounced land projections—the Norman peninsula (called "Cotentin"), which reaches out into the English Channel, with Cherbourg in its head, and the rock-bound peninsula of Brittany, with the very thriving maritime city of Brest near its westernmost point. In the angles between the Norman and the Breton peninsulas lie the Channel Islands—Jersey, Guernsey, Alderney and Sark—still ruled by the English Crown.

#### France's Chief River Ports

The coasts of France are usually either dangerously rocky, or low and sandy, so that there are comparatively few good harbours, except, of course, at the mouths of rivers. Of these river ports the most important are Le Havre and Rouen on the Seine, St Nazaire and Nantes on the Loire, and Bordeaux on the Garonne. The Rhone, owing to the great quantities of sediment carried down by its rapid current, and the low swampy character of the delta, offers no good anchorage.

The principal seaports which are not situated on rivers are Marseilles, greatest in France, Cherbourg, guarded by a huge breakwater and an important naval station, Boulogne, Dunkirk and Calais, in the extreme north, and La Rochelle on the west coast. Brest in Brittany, and Toulon on the Mediterranean, are important

naval stations, and figured largely in the World War, but have little general commerce.

It is mostly a smiling and fertile land that the French have inherited from their ancestors. A line drawn from Bayonne in the south-west to the wooded hills of Ardennes on the north-east border roughly divides the rolling plains of western France—less than 600 feet high—from the highlands of the east. In the midst of the highland section lies the confused mass of the Auvergne Mountains, with summits rising to 6,000 feet and numbering hundreds of extinct volcanoes, adjoining them to the south-east lies the chain of the Cevennes, extending some 200 miles, from the foot hills of the Pyrenees to beyond Lyons.

#### Mountain Ranges on the Frontier

To the east, separating Alsace from the rest of France, are the forest-clad Vosges, along the border of Switzerland rise the more important Jura Mountains, while from Switzerland to the sea, along the whole Italian frontier, stand the mighty peaks of the Alps. The summit of Mont Blanc (15,782 feet), which lies seven miles inside the French boundary, is the second highest peak in Europe, being surpassed only by Elburz peak in the Russian Caucasus.

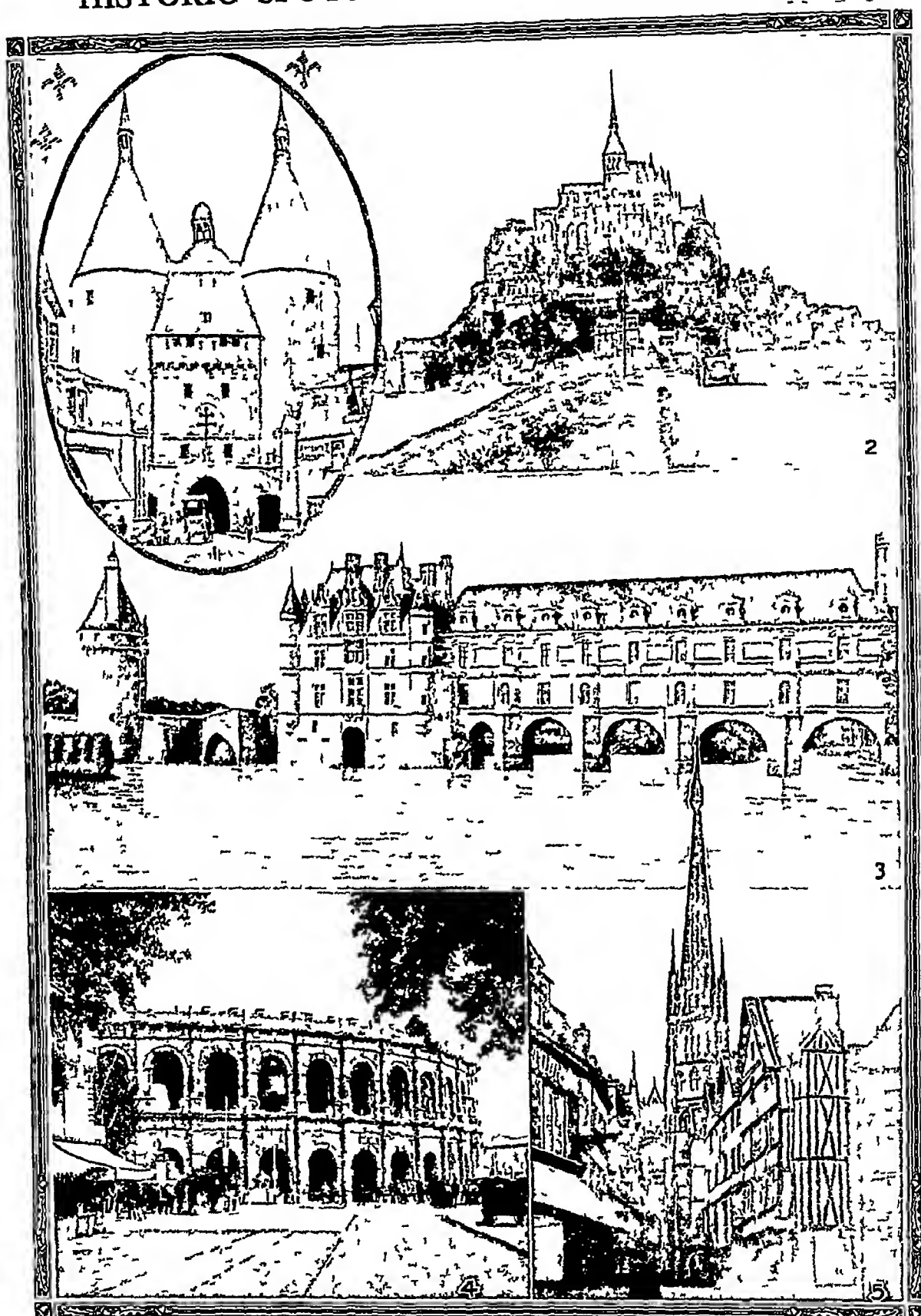
In Brittany and Normandy are minor groups of hills and mountains, some of them exceedingly rugged, but of no great height. North of the river Loire, in what is called the "Paris basin," the successive low elevations have a uniformly gentle slope toward the west, but towards the east they present abrupt faces. This striking peculiarity, which renders difficult military invasions of France from the east, explains Germany's invasion of Belgium in 1914.

Four great river systems—the Rhone, the Garonne, the Loire and the Seine—each with numerous tributaries, drain the well-watered soil of France. The Rhone, which carries the greatest volume of water, rises in Switzerland, flows into Lake Geneva, then out again, and enters France through a gap between the Jura and the Alps. At Lyons it picks up the waters of its great tributary, the Saone, and then turns sharply to the south by the bluffs of the Cevennes Mountains. The Rhone valley from this point to the Mediterranean coast is one of the most picturesque parts of France.

The river Garonne in the south-west of the country gathers its waters almost equally from the Pyrenees and the western slope of the Cevennes. The Loire is the longest of the French rivers, rising in the Cevennes south-west of Lyons, and crossing the breadth of central France, where it receives numerous tributaries, and pours at last into the Atlantic, south of the peninsula of Brittany.

In northern France the Seine, after collecting the waters of the Paris basin, winds sluggishly

# HISTORIC SPOTS IN PICTURESQUE FRANCE



1 One of the seven noted gates of the city of Nancy 2 Mont Saint-Michel, a curious town crowned by an ancient abbey-fortress on a rocky islet off the western coast of France 3 Chateau of Chenonceaux with its gallery built astride the Cher River 4 Ruins of the old Roman arena in Nîmes 5 View of an old street in Strasbourg

## FRANCE



### FRENCH PEASANT TYPES

Above is a Breton woman with her well-swaddled baby in brightly embroidered clothes. On the right are two men of the Basque country who, with a primitive zither and a violin, provide music for folk dances.

across the plain of Normandy and empties into the English Channel at Le Havre. On its chief tributary, the Marne, and on the Aisne, which flows into the Oise, another tributary, some of the most important battles of the World War were fought. (See World War)

In addition to these four river systems, there are several smaller rivers to be noted. The little river Somme, which runs parallel to the Seine 50 miles to the north, has been famous in history since the campaign which led to the battle of Crecy in 1346. The Meuse and the Moselle, rivers which rise in north eastern France, have most of their course in Belgium and Germany respectively. The Rhine also may now be reckoned as partly French, for it again forms the eastern boundary, following the restoration to France of Alsace Lorraine.

All the streams mentioned are more or less navigable, and connecting as they do with a great network of canals, they form a system of waterways extremely valuable to French industry and commerce. The Canal du Midi, which dates from the reign

of Louis XIV and connects the Mediterranean with the river Garonne and so with the Atlantic, is one of the most famous of French canals. There are others that join the Rhone, the Loire, the Seine and the Rhine systems, so that heavy freight can be carried entirely by boat to or from every important industrial region. The Rove Canal links the Rhone with Marseilles and includes the famous four and a half mile tunnel under the Rove hills. This tunnel, 70 feet wide and 50 feet high, is large enough to accommodate the heaviest barges which carry raw material from the chief port of southern France to the inland factories.

### France's Many Farmers

The greatest industry of France is agriculture. About half of the inhabitants earn their living on farms. The winds from the Atlantic Ocean, unchecked by coastal mountain ranges, carry abundant moisture to practically the whole land, thus producing conditions favourable to a wide variety of crops. Only in the extreme south west, where a straight monotonous stretch of sand dunes borders the "Landes," is there unproductive soil.

Wheat is the main cereal crop, particularly in the broad Paris basin, and France ranks as a great wheat growing country. After the middle of the 19th century meat production and dairying increased as cheap imported wheat

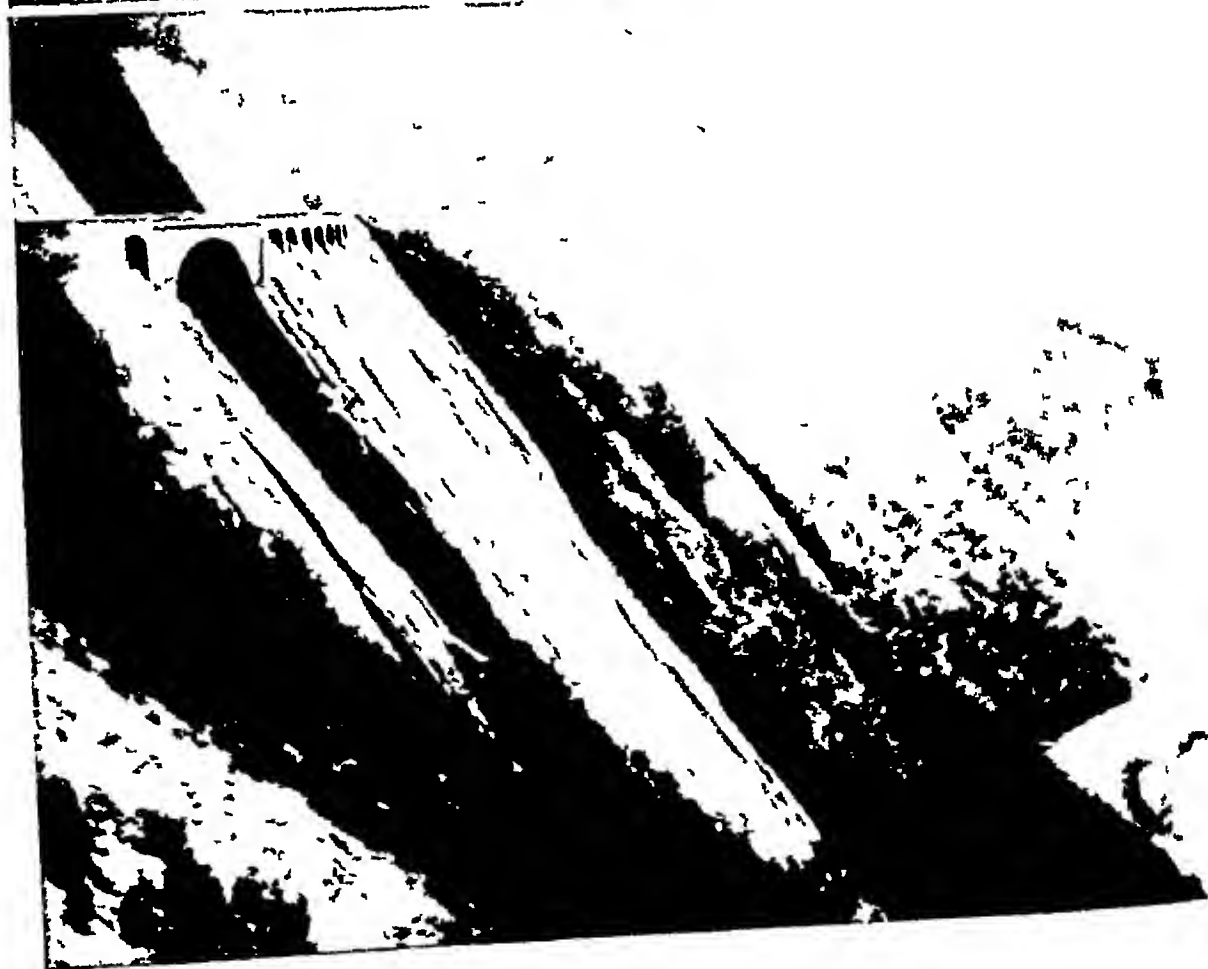




F A I

### *A YOUNG GIRL OF ALSACE*

An enormous bow of broad black silk, such as this girl is wearing, is typical of the peasant costume of Alsace a part of the territory which since the World War has been returned to France by Germany. Girls in the districts south and west of Strasbourg and sometimes servant maids from Alsace in other parts of France wear a similar but smaller head-dress. This girl wears the full Alsatian costume.





### *BY GORGE AND RIVER VALLEY IN FRANCE*

France presents landscapes of great variety and beauty between the flat country of the north and the mountainous district of the south. Top left is a scene on the river Tarn, which is a tributary of the Garonne. Between La Malene and Le Rozier it runs through limestone gorges of impressive grandeur. Here in the Defile des Etroits the cliffs are beautifully coloured. Below it are the great cliffs towering above the river Drac, which drains the southern slopes of the Dauphiné Alps. Viaducts, marvels of engineering achievement are a feature of this great ravine. Above is a scene on the Dordogne, which in its 300 mile course from Puy de Dome to the Garonne flows through some of the most beautiful scenery in France.

*Photos I N A Underwood*





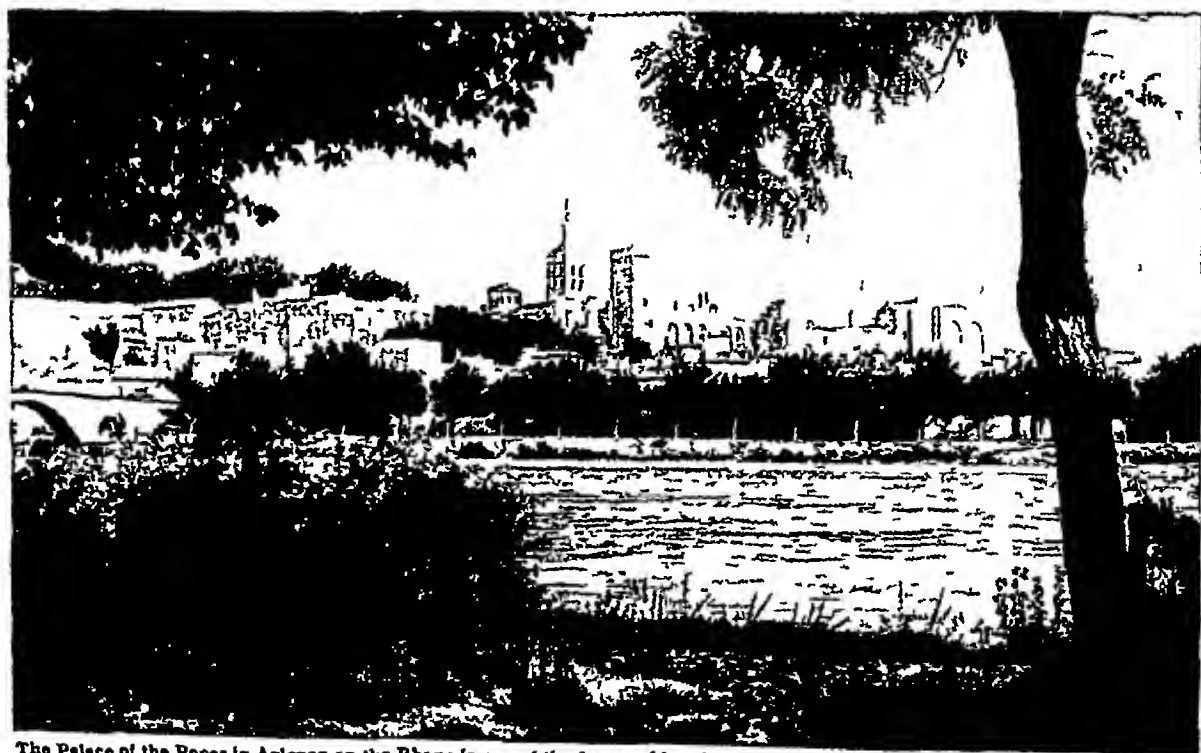
### PEASANT LASS OF NORMANDY

In Normandy and Brittany the French peasants still preserve their native costumes, and do their daily work in them. This girl goes about her business with her prairie-laden donkey in a costume that is at once picturesque and serviceable. The beautifully-carved wooden front of the house before which she stands is typical of Normandy.

## TWO CHARMING BITS OF SOUTHERN FRANCE



The whole coast of the Mediterranean from Cannes to the Italian frontier is a fairyland of beauty known as the French Riviera. It stretches for miles with famous resorts, quaint villages and vistas of great beauty. This view of the famed city, Nice, expresses some of the charm of this part of France. The hill in the centre is the "Château," the original village site.



The Palace of the Popes in Avignon on the Rhone is one of the famous historic structures of southern France. It was built between 1316 and 1370 during the period when the papal seat was at Avignon.

kept prices down. Import restrictions established in 1929 and a "pegged price" in 1930 promoted more intensive cultivation of wheatlands, and France had an exportable surplus in 1935. The change was resented bitterly, however, since the price of wheaten bread rose sharply. Oats rank next, and rye and barley are raised on the poorer soils of the coast and of the eastern mountain regions.

Sugar-beet, grown exclusively on the rich plains of the north, provides the raw material for hundreds of sugar factories and refineries. A coarse tobacco is grown in some scattered parts of France, but its cultivation, manufacture and sale is a government monopoly.

Among vegetables, potatoes take the first rank, as is to be expected in the land where the scientist Parmentier popularized the growing of that tuber by inducing King Louis XVI to wear the flower of the plant in his buttonhole.

#### Wine-producing Provinces

More wine is produced in France than anywhere else. The provinces of Champagne and Burgundy, the regions about Bordeaux, the valleys of the Loire and the Rhône, and the hills of Languedoc in the south, are famous the world over for the products of their vineyards. In Brittany and Normandy cider is produced.

On the luxuriant meadows of the great French plain beef and dairy cattle are raised in great numbers, while the northern provinces rear those famous breeds of draught horses—the Breton, Norman, Percheron and Flemish. The slopes of the Pyrenees are noted for mules, pigs thrive everywhere, sheep and goats are raised in great numbers on the high pasture lands of the Cévennes, the Vosges and the Jura, and vast quantities of poultry and eggs are marketed in all sections. Live stock production increased steadily from 1900 to 1913, but during the World War stocks were greatly depleted and afterwards were only slowly brought back to pre-War figures.

Since before the days of the French Revolution the land of France has been divided up among many small owners, and the laws of inheritance and the customs of the people tend to perpetuate these small holdings. The average size of a French farm is about 17 acres. It is this peasant ownership of the soil which tends to promote thrift, hard work and intensive cultivation, as well as that spirit of independence and attachment to the soil which characterize the French peasant.

France ranks high among fishing countries. The north coast provinces send large fleets each year to the cod fisheries of Newfoundland and Iceland, as well as to the haunts of the herring shoals in the North Sea. On the west coast oysters and sardines are fished, and in the Mediterranean sardines, anchovies and tunny.

About 18 per cent of the soil of France is covered with forests, especially the more mountainous regions. The quarries of the highlands produce plenty of stone for constructional work, particularly granite. The typical French farm house is built of stone with a thatched roof; the barn is also of stone, and most of the old land boundaries are low stone walls.

The greatest of France's mineral resources are her iron and coal deposits, on which are based her important manufacturing industries, etc. Since the return of Alsace Lorraine France has been one of the greatest iron-mining countries in Europe, her chief mines being in Lorraine. Most of the French coal seams, which are much less extensive than the iron deposits, are along the Belgian border. Many of these mines were seriously damaged by the Germans when they evacuated the territory at the close of the War.

As partial compensation the administration of Germany's rich coal-fields in the Saar basin, lying just across the border from Lorraine, was committed for 15 years to the League of Nations. In 1935 the Saar was reunited with Germany. The principal centres of French steel and iron manufacture are Lille, Nancy, Le Creusot (famous for making big guns) and St Etienne. The last two have their own coal deposits.

The textile industries of France are famous the world over. The city of Lyons on the Rhône is one of the great silk centres in Europe. Normandy, and particularly the city of Rouen, is noted for its cotton cloth. Woollens, which rank high among French exports, are mostly manufactured in the region from Lille to Reims. Linens are made in Lille, Roubaix and other northern towns. The laces of Normandy and Brittany fetch high prices.

France is distinguished also for her fine leather goods, the exquisite porcelains of Sèvres and Limoges, the cut glass of Baccarat, the jewelry made chiefly in Paris and its environs, and countless other articles of art and fashion.

#### Paris, the Nation's Centre

More than in any other great nation, perhaps, the life of France centres in her capital. Paris is the real heart of the nation's commerce and industry, of its social and political affairs. The wonderful system of French roads (the Routes Nationales), built up and extended from the famous old Roman roads, focuses upon Paris. All the big railways, partly owned by the government and partly by private companies, converge there, and so do the waterways. So strong is the intellectual and artistic influence of Paris that it has earned for the metropolis the title of "intellectual capital of the world."

France is a republic, its form of government being modelled on the parliamentary plan. For administrative purposes the country is divided into about 90 "departments," taking the place

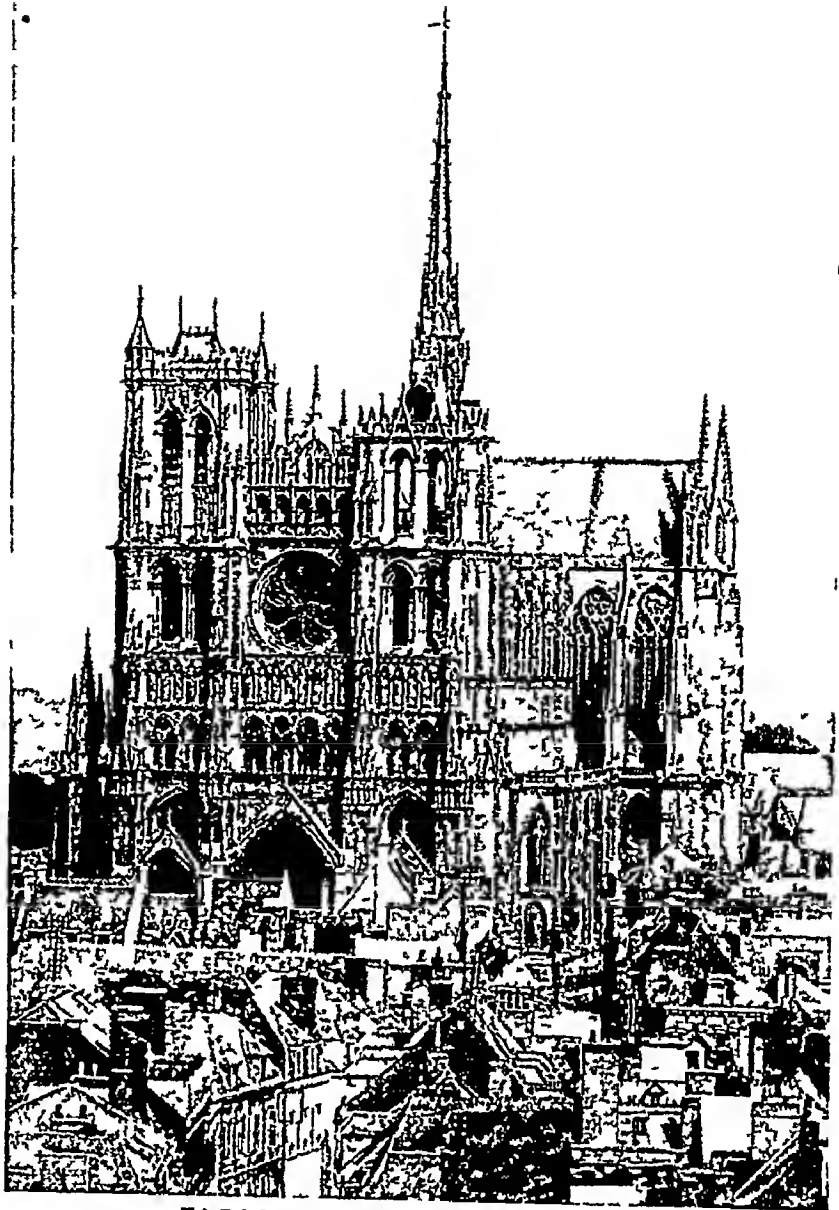
of the pre-Revolution provinces, the names of which are still sometimes used. In each of the departments a certain number of deputies are elected for four years by popular vote of all male citizens 21 years old or over. These form the Chamber of Deputies which sits in Paris. The Senate or upper house of the Parliament is composed of about 315 members elected for nine years by special delegates, by the deputies, and by certain local officials in each district.

The Senate and Chamber of Deputies jointly elect the President, whose term is seven years. Although he is the nominal head of the government, the true executive head is the Premier or President of the Council of Ministers, who is selected by the President from the dominant political party, and who in turn chooses the other members of the ministry or cabinet. This includes the ministers of the various State departments.

It has been said that every man has two countries, "his own and France." This suggests truly the charm that visitors find in this smiling land. The most striking thing is the evidence found everywhere of France's stirring history. Perhaps it is an old walled city, such as Carcassonne, whose stone towers and battlements still stand much as they were in the far-off Middle Ages. Perhaps

it is the marvellous triple arched Roman aqueduct, flung across the river valley near Nîmes 18 centuries ago and still standing in its majestic simplicity. Or it may be the twin spires of William the Conqueror's famous Abbey church at Caen in Normandy, or the queer crooked streets of Rouen and the ancient houses that once looked down upon the procession which bore Joan of Arc to the stake.

Those who have seen the great Gothic churches which, like gigantic carved jewels, are to be found everywhere in northern France—at Amiens, Chartres, Le Mans, Reims, Paris, etc.—will never forget their soaring grandeur. And



#### FAÇADE OF AMIENS CATHEDRAL

Amiens Cathedral is regarded as the finest example of Gothic ecclesiastical architecture in France, and this photograph shows the wonderful stone work of the western front. Between the towers is a magnificent rose window, while along the front is a row of statues of the kings of Judah. The cathedral was mainly built in the 13th century to the plans of Robert de Luzarches.

*French National Railways*

those who have visited the famous châteaux of France will have read some of the most stirring pages of French history in letters of stone.

But the list is endless. Besides these great monuments of the past, France possesses, in the Palace of the Louvre in Paris and elsewhere, some of the rarest of museum collections.

Everywhere the tourist and the student find inspiring associations and reminders of the great men and women who shaped France's destiny. Here St. Bernard's fiery eloquence launched the Second Crusade. There the great dramatist, Molière, spent his childhood. Here Victor Hugo sat writing that wonderful book "Notre Dame

de Paris " In this village Pasteur showed doubting scientists how germ diseases could be warded off. In that house the chemist Lavoisier stayed awake for 12 days and 12 nights, and then announced the discovery of oxygen. There Marie and Pierre Curie discovered radium. And what solemn memories come to those who visit the battlefields of the World War.

But, more than all else, it is the charm of the French people that remains indelibly in the

visitor's mind. Courteous and hospitable they create an atmosphere of "home" that has led many a world-weary traveller to settle permanently in beautiful France. Sometimes it is called *l'art de vivre*, which may be translated as the art of knowing how to get the most and the best out of life, combining work and pleasure. But even this is not sufficiently comprehensive and we have to search deeper to find, each for himself, its spiritual value.

## From OLD GAUL to the THIRD REPUBLIC

*French history is full of famous names—from Charlemagne to Clemenceau—and of such stirring events as Joan of Arc's campaign and the great Revolution. Something of this thrilling tale is related in this chapter.*

**France, HISTORY OF** At the time of the Roman conquest, France was occupied by a large number of independent tribes, who were of



St. Joan of Arc

"Mediterranean" stock (see Races of Mankind) and spoke various dialects of a Celtic tongue. The Romans found the conquest of these tribes no easy matter, but Julius Caesar finally overcame them and established organized Roman government (58-51 B.C.). The Gauls, as the Romans called these natives, adopted the Roman dress, language,

and customs. Christianity spread from Rome to Gaul, where it was widely accepted as early as the 4th century.

With the decline of the Roman Empire German barbarian invaders entered Gaul. Chief among these were the Franks, who under Clovis (c. 466-511) established Frankish rule over most of that land. His adoption of Christianity led to the conversion of all those who served him.

The Merovingian dynasty, of which Clovis was the founder, was thrust aside by a new family—the Carolingians—who had been the "Mayors of the Palace," and now gave new life to the declining Frankish state. The greatest ruler of this line was Charlemagne, whose reign belongs to world history. He became the supporter of the Christian Church and was crowned Emperor of the Holy Roman Empire by the Pope in Rome on Christmas Day, 800.

Charlemagne's empire after his death fell into three parts: the western part becoming the kingdom of France. But the word "kingdom" meant little, for the spread of the feudal system distributed the power of government among local rulers, and left to the king little but nominal

overlordship. Under the Capetian kings, of whom Hugh Capet was the first (987), this system reached its height. (See Feudal System.)

Some progress was made under Philip Augustus (1180-1223), Louis IX (1226-1270) and Philip IV (1285-1314). But France was still in a disorganized state when the Hundred Years War with England (1337-1453) impoverished her and led to conditions approaching anarchy in many parts of the country. A French peasant girl, Joan of Arc (q.v.), became the national heroine by turning the tide against the English, who were finally driven from the soil of France.

France slowly recovered, and her kings—chiefly Louis XI (1461-83)—gradually were able to unify the nation and to centralize government in their own hands. Louis XIV (1643-1715) marked the culmination of the power of the sovereign. He was indeed "the state." His authority was envied by the sovereigns of Europe and his court was imitated (see Louis, Kings of France). Meanwhile Protestant (Huguenot) ideas spread in France in the time of Francis I (1515-1547), and civil wars over religion, which occupied the latter part of the 16th century, followed. Though France had rejected Protestantism, partial toleration was granted by Henry IV (1589-1610) in the Edict of Nantes (1598).

### Conflict over Colonies

The 18th century witnessed a long struggle between England and France for colonial empire. The Treaty of Paris (1763) marked the loss by France both of her great dominions in America and of her ascendancy in India. This loss, together with inefficiency and abuses at home, brought much criticism upon the government. An educated middle class was growing up who were dissatisfied with the "old regime," or order, and demanded an influence in the government proportionate to their wealth and education.

The crisis came when the financial difficulties of the state, which had been increased by the help afforded to the American colonies in their



## FRANCE: HISTORY

struggle for independence from England, forced the government to call the Estates-General in 1789. Then followed the Revolution, a struggle against foes within and without in order to establish a new political and social order. The failure to set up an able and just government paved the way for the *coup d'état* of Napoleon Bonaparte (See Napoleon, French Revolution).

As Emperor of the French (1804-14) Napoleon attempted to make the French power supreme in Europe. The attempt failed, and in the Peace of Vienna (1815) France was reduced to its former limits. But the great principles of the Revolution—nationality, constitutional government, and equality before the law—had laid the foundations, not only of a new France, but of a new Europe. Perhaps the most permanent work of the Revolution was to give the French peasants the land, which they have continued to own to the present day.

### Revolution after Revolution

But France was slow in accustoming herself to the new order. The Revolution of 1830 (July 27-29) overthrew the restored Bourbons—who had “learned nothing and forgotten nothing” in the great Revolution—and brought in the Orleanist prince, Louis Philippe, as a constitutional monarch. But he too fell, in the Revolution of 1848 (February 22-24), and after a second republic, the Second Empire began under Louis Napoleon Bonaparte (nephew of Napoleon), who had a troubled reign of 20 years (1851-70) as Napoleon III.

The lightly-begun but disastrous war with Germany (see Franco Prussian War) ended the Second Empire. For several years the government of France was then unsettled, but with the establishment of the constitution of the Third Republic (1875) a new stability and political control became evident.

In the World War of 1914-18 France gave abundant proof that a democratic government can be efficient. French losses in man power and property were prodigious. More than one fifth of the total population was mobilized, and losses in killed and wounded ran well into the millions. More than 9,000 square miles of northern France were occupied by the rival armies. This section contained approximately one eighth of France's population, and a great share of the nation's industries and mines. At the close of the war this region was one vast scene of desolation. Hundreds of towns, with their factories and homes,

were deserted wastes. Millions of acres of once smiling farm-land had been scarred with shell holes and trenches. (See the chapter on the World War of 1914-18).

Restoration of this area to its pre-War condition required the expenditure of billions of francs, but it was expected that whatever was spent would ultimately be recovered from Germany under the terms of the Treaty of Versailles. Failure to secure large amounts in



CORONATION OF CHARLEMAGNE

Crowned in the old church of St. Peter's, Rome, A.D. 800, "in shape and gesture proudly eminent, Charles, already King of the Franks for over 30 years, became Emperor amid the acclamations of the people. The Holy Roman Empire which he thus founded lasted till 1806. In this picture the artist has imagined an angel about to place a wreath upon the head of Charlemagne.

From the painting by H. Levy





### HOW NAPOLEON SEIZED THE HELM OF STATE

The Republic set up by the 1789 Revolution in France did not work very well, and ten years later the government was in the hands of only five men who called themselves "the Directory." They were unpopular, and Napoleon, who was too young to belong to the Directory, determined to overthrow it. This painting by François Boucher, in the Paris Louvre, shows the dramatic scene in the Council of Five Hundred when Napoleon's soldiers dispersed the Council and arrested two members of the Directory. This "coup d'état" was accomplished on November 9, 1799.

reparation payments affected French politics, and brought the downfall of the cabinet of Aristide Briand in January 1922. The more vigorous Raymond Poincaré, who succeeded Briand, adopted a strictly repressive policy against Germany, and attempted to force payments by seizing the Ruhr valley, Germany's greatest coal and manufacturing district. This costly and unsuccessful venture tended to widen the divergence of opinion between France and Great Britain, it was also unpopular among the Socialists in France.

Of all the Allied nations, France seemed to gain most from the World War. Alsace and Lorraine, returned to France by the Treaty of Versailles, supplied coal and iron to rebuild the great French steel industry, and potash to stimulate the chemical industry. More coal came from the Saar basin, controlled by France until

its return to Germany in 1934. Great water power plants were installed, factories were modernized, areas devastated by the War were reconstructed. Reparations from Germany were expected to pay for these improvements, and so, indeed, they did in large measure.

The huge reparations to be paid by Germany under the Dawes Plan of 1924 were, however, reduced by the Young Plan of 1928, postponed by the 1931 Hoover moratorium, and finally almost cancelled at the Lausanne Conference in 1932. At the same time France ceased payment on its war debt to the United States.

Feeling its security menaced by the nations that demanded revision of the Treaty of Versailles, France vigorously supported such movements for collective security as the League of Nations, the Locarno Pact (1925), and the Briand-Kellogg Pact outlawing war (Part of

## FRANCE: HISTORY

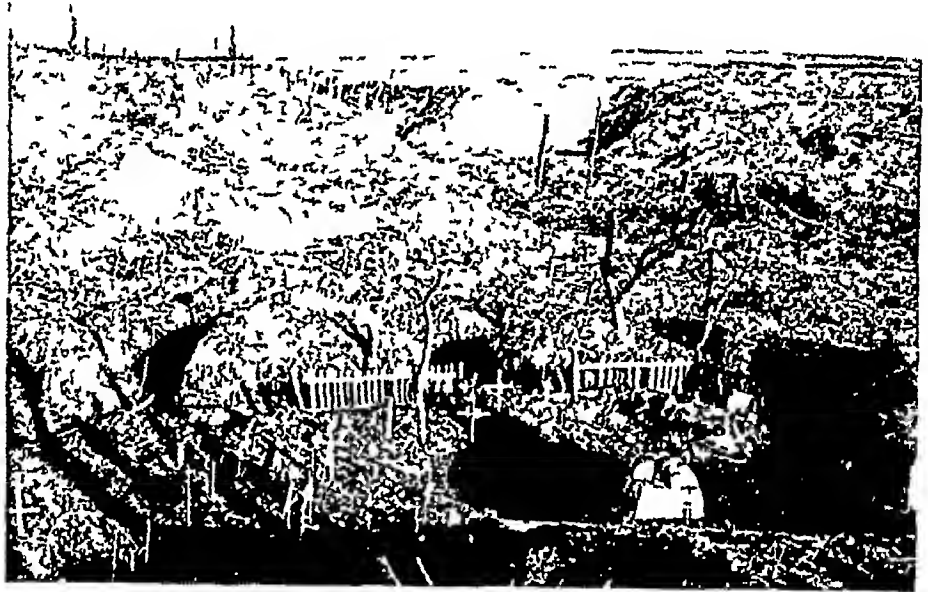
Paris, 1928) At the same time, however, France enlarged its army and navy, protected its borders with the "Maginot line" of fortresses, and formed alliances with Belgium, Poland, Czechoslovakia, Yugoslavia, Rumania, and Russia.

The cost of the defence programme and of reconstruction caused in the French budget a deficit which by 1926 reached alarming size. The treasury was empty, taxes were high, prices rose, and the value of the franc slumped from 87 10 to 238 75 francs to the pound sterling. In other words, the value of the pound (£1) rose, in terms of francs, to £1 19s 2d. Farmers and shopkeepers who had cautiously invested in government bonds found their savings wiped out by this inflation. A National Union cabinet, headed by Poincaré and containing six former premiers, balanced the budget by drastic economies, and late in 1926 stabilized the franc on a gold basis at approximately 125 francs to the pound sterling. For a time the country seemed prosperous.

But between 1930 and 1933 other countries also devalued their currencies. France was caught in a deflation which kept wages and farm prices low, reduced

the French tourist trade and export markets, and brought widespread unemployment. Yet no premier dared suggest ending this deflation by reducing the value of the franc, for the tragedy of the 1926 inflation was still too well remembered.

The French Chamber of Deputies, divided into many small parties, proved an unstable body for facing troubles at home and abroad. On its left sat Communists and Socialists, on the right were Nationalists, Royalists, and, after 1933, Fascists. Radicals and Radical Socialists sat in the centre, and in spite of their names, represented the conservative land owning farmers. No party had a majority, to stay in power, a premier had to satisfy several parties. Premiers who succeeded in foreign affairs were defeated



### HOW FRANCE'S SCARS OF WAR HAVE BEEN HEALED

Above is what remained of the French village of Beaumont Hamel, considered the strongest fortress in the German line in November, 1916, after it was taken by British troops. Notice the huge dug-out and the graves of the fallen. The unrecognizable heap on the left marks the spot where stood the village church. Below, you see the same village rebuilt as it is today.

on domestic issues, and a crisis abroad often brought the fall of a cabinet engaged in domestic reform. Fascist groups, such as the Croix de Feu, demanded a dictator who would end all party bickerings.

Paul Doumer, who was elected president in 1931, was assassinated by a madman in May, 1932. His successor, Albert Lebrun, called cabinet after cabinet without finding one which could command a stable majority in the Chamber of Deputies. Popular disgust turned to rage in



#### FRENCH WORKERS TAKING PART IN A 'STAY-IN' STRIKE

Following the coming into office of the "Popular Front" in France there was a wave of strikes in which a new technique was displayed. Instead of leaving work and going home, the employees refused to leave their factories, shops and offices—though they did no work there. The men (and women, too, if you look at the upper windows) seen in this photograph, were such voluntary prisoners at the big Farman motor and aircraft factory in Paris on May 29, 1936. All over Paris, workers "stayed in" in sympathy, even shop girls slept on the counters in department stores.

December 1933, when France learned that a swindling financier named Stavisky, who had forged millions of pounds' worth of bonds of the municipal pawnshops, was probably aided by friends in high government positions. In the "Stavisky riots," the people showed their dissatisfaction with the Chamber of Deputies and many of them turned to the Fascist leagues as the only hope for restoring stable rule.

Rioting ceased when the universally-respected ex-president Gaston Doumergue became premier, but his drastic economies proved unpopular and he was forced to retire. His successor, Pierre Laval, was chiefly concerned with keeping the war between Italy and Ethiopia (1935-36) from spreading through Europe.

Meanwhile, fear of a Fascist revolution caused Communists, Socialists, and most Radical Socialists to unite for the first time in a "Popular Front" of left-wing parties. In the 1936 elections the Popular Front won a sweeping victory, and the Socialist Léon Blum became premier.

A wave of "stay-in" strikes marked Blum's taking office. A million French workers occupied

the factories without violence, and, with government aid, won a 40 hour week, higher wages and holidays with pay. Most important of Blum's economic reforms was the assumption by the government of control over the Bank of France, previously controlled by the same famous "200 families" who owned most of France's banks, insurance companies, and heavy industries. Control of the Bank of France carried with it control over government finances and over much of the industry of the country. Late in 1936 the franc was devalued by about 25 per cent to bring it into line with the devalued dollar and pound.

Abroad, however, relations between Germany, Austria, and Italy pointed towards what might become a Fascist alliance, and suggested troubles ahead for France. Hence the Blum ministry made vigorous efforts to get the powers to pledge themselves to neutrality in the Spanish civil war, which threatened to involve all Europe.

But while his foreign policy was fully endorsed by both Chamber and Senate, Blum was forced to resign early in 1937 when the Senate refused his demand for semi-dictatorial powers.

# SPLENDOURS *of* FRENCH PAINTING

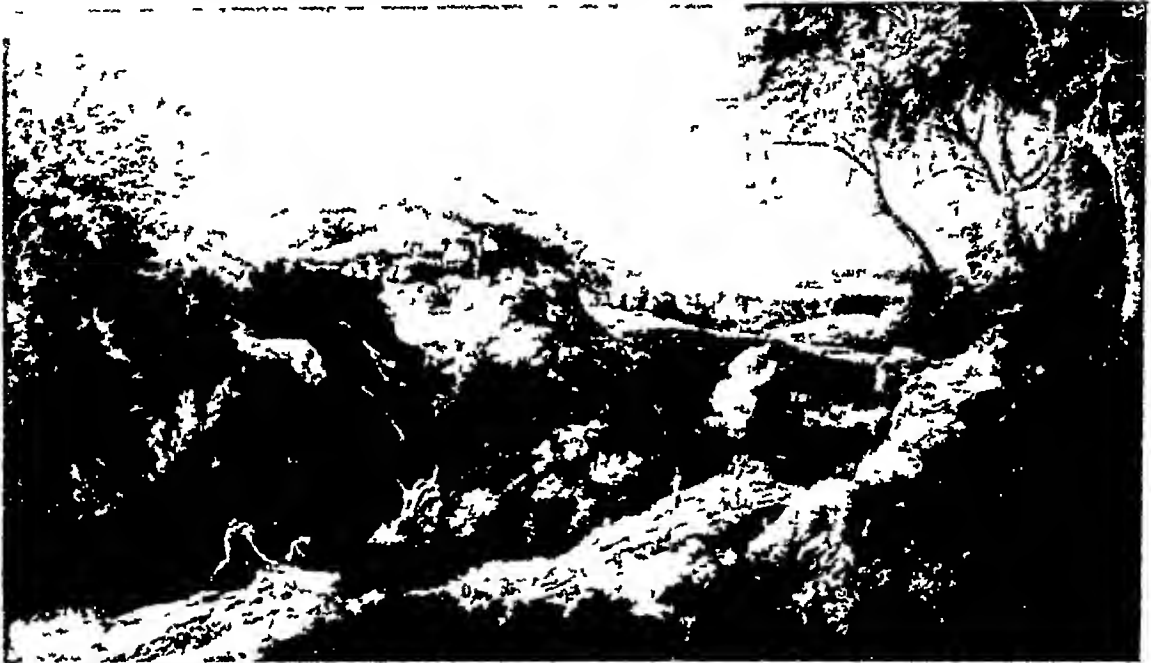


This superb portrait of Cardinal Richelieu in the grand manner, now in the National Gallery is strangely enough an almost exact replica of another painting by the same artist in the Louvre Paris. Philippe de Champaigne (1602-1674) though one of the earlier French portrait painters was none the less a brilliant artist, especially when he had a great man as his sitter. Also in the National Gallery is a most interesting portrait showing three views of Richelieu's head by the same artist.



**THE GRANDEUR OF CLAUDE LORRAIN'S ART REVEALED IN A CLASSICAL COMPOSITION**  
In many ways the inventor of the 'classical school' in painting and also the first great master who was essentially a landscape painter Claude Lorrain like Philippe de Champaigne was painting during the greatest period of French artistic activity. Conceived always as a complete whole his huge paintings are crammed with figures (which he seldom did himself) with classical and pseudo-classical buildings and ruins with ships and with exquisite studies in landscape. Yet they command attention by their unity and completeness as works of art. This picture 'The disembarkation of Cleopatra at Timon' is in the Louvre.

## EARLY MASTERPIECES BY POUSSIN AND LE NAIN



The artists of the two pictures you see above came before the great period of French painting. Poussin, painter of the upper picture, was the artist of many fine early landscapes. Le Nain, on the other hand—the name is used to describe the work of three brothers—bringing something quite new to French art, depicted the life of the lower classes. "The Card Players" (below) is one of their finest works.

*Lower picture at Buckingham Palace by gracious permission of H.M. the King copyright Fine Arts Publishing Co. Ltd*



# FAMOUS BEAUTIES IMMORTALIZED ON CANVAS



Here are two famous beauties depicted by two great French painters. Top done with all the easy grace of Boucher's brush, is Madame de Pompadour (National Gallery, Edinburgh); below David's rendering of Madame Récamier (in the Louvre) makes an interesting contrast. The lace and fripperies of the Golden Age of Louis XIV have given way to the restrained classical—but no less revealing—severity of the Empire's manner.

## SIMPLE CHARMS OF CHARDIN'S RESTFUL ART



It is perhaps characteristic of the great encouragement given by the State to all genuine artists in France that Chardin, who was doing such quiet homely studies as this during the rich and florid age of Louis XIV, should have received full recognition from the greatest in the land. In any other country he would have worked unknown, to be discovered by collectors long after his death. This lovely painting, "La mère laborieuse," is in the Louvre, but you can see fine examples of Chardin's work in England especially at the National Gallery. He was a great colourist and, learning from the Dutch, knew how to make the most of light and shade in his interiors.

## PEASANTS & COUNTRYSIDE BY BARBIZON MASTERS



J. F. Millet was the real founder of the Barbizon School. Glorifying the French peasants in a series of pictures of which "The Angelus" (above, from the Louvre) is perhaps the best known, he drew round him a group of similar painters who, however, specialized more in the countryside itself than in its inhabitants. Among these a typical example was Théodore Rousseau (1812-1867), whose "Sunset at Fontainebleau" (lower picture, Louvre) though influenced by Corot (see page 1149), has a truth to Nature which is distinctly pleasing. Tremendous prices were paid towards the end of the nineteenth century—though not now—for pictures such as this.

## IMPRESSIONISM AND AFTER: MONET & CEZANNE



*Bullox Photo*

Claude Monet was the actual founder of Impressionism the most important movement in pictorial art since the Renaissance. His chief preoccupation was with the effects of light, and with their correct notation in paint, as is well exhibited in his 'Break up of the Ice' (top on loan in the National Gallery). Cézanne on the other hand a leading figure in the Post-Impressionist movement—so called only because it came after the other—was more concerned with the constructional aspect of Nature. In the quiet, beautifully-modelled river scene above you see how economical was his brushwork—how simply he could convey the solidity and mass of natural objects.

## RENOIR FINDS BEAUTY IN UMBRELLAS



Renoir is one of the Impressionists whose work is often hard to understand and to appreciate but no one should have any difficulty over such a lovely painting as this. Entitled 'Les Parapluies' (the umbrellas) it shows a typical French crowd caught in a sudden rainstorm. Renoir was interested in people as you can see and all his women and children have a delightful vitality which contrasted strongly with the stiff severe and dull academic pictures of his day. This painting hangs in the National Gallery, London.

# A ROLL CALL of FRENCH PAINTERS

*For hundreds of years France has been in the van of culture on the continent of Europe, and the achievements of her great artists well deserve to be set beside the masterpieces of her men of letters*

**France, ART OF** The art of France—or, at least, the pictorial art with which we are here principally concerned—begins with the



Baron Schwiter, a Portrait by Delacroix

glories of the illuminated manuscripts. As in England, these went through a number of periods and "schools," of which the culmination was the 15th century school, marked by the superb manuscripts done for the Duke of Berry. Early printings which survive include the famous "Parement de Narbonne," executed on silk about 1375, the works of Jean Malouel, with

their pronounced Siennese influence, and certain other works, also showing Italian influence, which resulted from the establishment of the Popes at Avignon during the 14th century.

It is, however, to the list of the schools of illumination that we turn for our first really great French pictorial artist, Jean Fouquet (c. 1415-1485). Combining both Italian and Flemish influences, Fouquet was not only an absolute master of miniature painting and illumination, but also a painter of the first rank, both of portraits and altar pieces.

During Fouquet's lifetime, too, were done the *Picta* of Vaucluse at Avignon, which you may now see in the Louvre, the lovely Annunciation of Aix-en-Provence, and the glorious triptych of Moulins cathedral—none of them attributable to any known artist. Mention may be made also of the works of Nicolas Froment and Enguerrand Quarton. It is, however, in the 16th century that we find the first really great names in French painting.

## Some Early Portraitists

Jean Clouet (died c. 1541), his son François Clouet (died 1572), and other members of their school, did many excellent portraits, distinct enough from all other contemporary art to make them the founders of a real French school. Corneille de Lyon (1505-1574) was another painter whose rather more life-like portraits are executed in much the same manner. A great advance is seen in the works of Ambrose Dubois (1543-1614), who, like the majority of these earlier French painters, was of Flemish extra-

tion. Through him Italian masters exercised a tremendous influence in France. Simon Vouet (1590-1649) similarly worked from Italian principles, and Sebastien Bourdon (1616-1671), following the same lines, did small *genre* pictures of great charm.

While the French Académie school were still working on Italian lines—for the Académie had been founded in 1648—a new, more national art was springing up. It was due in part to the work of the three brothers Le Nain, whose individual efforts cannot therefore always be distinguished. They were Antoine (c. 1588-1648), Louis (1593-1648), and Mathieu (1607-1677), and they principally depicted the lives of the French lower classes. A far greater figure than any we have so far encountered was Nicolas Poussin (1594-1665), who, living for many years at Rome and influenced by Titian and Raphael, brought about a complete revolution in French art. He illustrated the myths of classical antiquity and scenes from the Bible, and painted some of the world's finest landscapes. In figure painting, too, he stands high above all his French contemporaries.

## Art under Royal Patronage

With the policy of Louis XIV, art had begun already to come under the direct patronage of the State, and many fine portraits, such as that of Richelieu, were done by Philippe de Champaigne (1602-1674) and others. Charles Le Brun (1619-1690), Louis' court painter, was in 1660 put by Colbert in charge of the royal tapestry works of Gobelins, and from that date art in France, officially recognized, encouraged and supported by the State, has been one of the country's major export industries.

So great is the number of excellent French artists that we can now only make a selection of the world famous. The next great figure is Claude Lorraine (1600-1681), known usually as Claude, or as Claude Lorraine. (See Lorraine, Claude.) Claude worked in Rome, which accounts largely for the antique decoration, the classical ruins and the titles of many of his finest pictures. But the figures in his works were hardly ever done by Claude himself, and it is as the first great landscape master that we hail him. In painting the effects of light, and especially the warmer lights of evening, Claude has never been surpassed, except, possibly, by Turner, and his influence was tremendous.

As you see, these last named French painters, together with innumerable lesser men, were



contemporaries, flourishing for the most part in the earlier half of the reign of Louis XIV. In the later part of the reign and on into that of Louis XV come many fine painters, such as François Desportes (1661-1743) and J. B. Oudry (1686-1755), and the great master, Antoine Watteau (1684-1721). Watteau lived in Paris, so that here at last we have an artist whose work is truly French. In many ways, but especially in his development of the treatment of light and shade, Watteau made painting history. He was largely influenced by Rubens and by the great Venetians. And though fame came slowly, he is known now as one of the greatest of all decorative artists as well as a superb draughtsman, his influence, not only directly in France, but indirectly on all subsequent European painting, is immense.

Contemporary with Watteau are other great painters, such as Lancret (1660-1743), who, though older, was his pupil and who emphasized the frivolous side of Watteau's manner, and Chardin (1699-1779), one of the world's greatest painters of still life and interiors, all of which showed strong Dutch influence, and a fine portraitist in pastel. He it was who taught Fragonard (1732-1806), another painter in the Watteau tradition, with whom is bracketed Boucher (1703-1770), known for his delicious portraits of Madame de Pompadour and equally lovely nudes. Many of these great artists, it should be noted, were also great etchers.

#### End of the Decorative Period

With the death of Fragonard comes the end of the exquisitely decorative period of French art, when not only painting, but all the other arts, from book-illustration to ceramics and furniture, had flourished exceedingly, influencing the whole of western Europe. You have only to think of the Gobelin tapestries, the Sevres porcelain, the furniture which bears the name of the designer Boulle (1642-1732), to see this. But with the French Revolution, or

shortly after it, came the Industrial Revolution, and few artists indeed could survive the double storm. Among them, however, was one great painter, Louis David (1748-1825), who was equally important under the Republic and under Napoleon, for whom as court painter he did much of his finest work. David painted portraits, such as the lovely Madame Récamier, and he was also the chief founder of the "Directoire" and, later, the "Empire" styles, which had tremendous influence in England. Other painters of this time were Isabey (1767-1833)

Prud'hon (1758-1823), Gros (1771-1835), and finally Greuze (1725-1805), whose small and lovely paintings enjoy lasting popularity.

The first name of the next period is that of Eugène Delacroix (1798-1863), founder of the "Romantic Movement." Delacroix was a tremendous admirer of Constable, the chief manifestation of this was the brilliance and purity of his colour. A fine draughtsman, he painted some superb portraits, of which an excellent example, which is in the National Gallery, is seen in page 1733 and for his originality in breaking away from tradition, he has been called the "founder of Modern Art." Parallel with him worked Ingres (1780-1867), whose pictures are remarkable for the smooth quality of the



#### BY A DESCENDANT OF IMPRESSIONISM

The Impressionist manner is visible in this very pleasant painting—'The Window'—by one of the more important though more academic, of living French painters, Pierre Bonnard. It is typical of the work of those who sought to maintain and to develop certain aspects of the Impressionist tradition.

Tate Gallery London

paint and the delicacy of the brush work, and indeed it was Ingres' proud boast that he carried on the old tradition of his master, David, rather than going in for novelties as did his rival. At the same time, too, the masters of the "Barbizon" school were beginning to work. The chief of these were Diaz (1808-1876), Théodore Rousseau (1812-1867), Courbet (1819-1877), Dubigny (1817-1878), and—in a way rather out of the others—Corot and J. F. Millet. The Barbizon landscape painters enjoyed a tremendous vogue during the nineteenth century. Corot (1796-1875) alone has suffered no eclipse. His landscapes may no longer command attention, but his earlier genre work and his fine portraits

are better appreciated than ever Millet (1814–1875), with his famous series of pictures which glorified for the first time the French peasantry, is among the world's best known painters

Outside the general run were Puvis de Chavannes (1824–1898), greatest of modern mural decorators, and Daumier (1808–1879), a caricaturist and realist of immense power and great originality. As these men reached the height of their fame the great French Impressionists were already at work. For by the middle of the 19th century art in France had at last become freed from officialdom, largely through the efforts of Delacroix, both as painter and teacher, and the various "Indépendants" could work on their own lines and receive recognition. Thus, when Napoleon III inaugurated the "Salon des Refusés," in 1868, for those whose works were not accepted by the Salon proper, artistic freedom was complete.

#### Leaders of Impressionism

The Impressionists are described under Impressionism, where some account of their successors, the post Impressionists, is also given. Here it remains to do little more than name them. First, as the originator of the Impressionist manner, was Claude Monet (1840–1926). His leading followers were Edouard Manet (1832–1883), who painted landscapes and interior scenes, Renoir (1841–1919), a painter of portraits and *genre*, Sisley (1840–1899), an Englishman who did landscapes, Degas (1834–1917), painter of the ballet and of horses, and the satirist, Toulouse-Lautrec (1864–1901). Others, whose work was based on Impressionism, were Seurat (1859–1891) and Camille Pissarro (1830–

1903). The great post-impressionists were Gauguin (1848–1903), Cézanne (1839–1906), and Van Gogh (1853–1890), who was a Dutchman. Picasso (b. 1881), founder of Cubism and by far the most important influence on modern painting, is a superb draughtsman, a tireless experimenter, the leader of the now ceaseless efforts to find a pure art, an unrepresentational art for art's sake. His contemporaries include Braque (b. 1881), who worked with him, and Matisse (b. 1869), another very influential painter, whose chief preoccupation is the creation of a fine colour-pattern. With him, as a leader of the "Fauves," was Derain (b. 1880), famous as a designer of theatrical settings. The work of Vlaminck (b. 1876), like that of Beaudin, Vuillard, and Utrillo (b. 1883), shows Impressionist influence, and among the more modern men are Ozenfant and Jean Lurcat, of whom the first represents "Purism," and the second the "New Independents." Many of the best "abstract" painters, together with the Surrealists and representatives of other strange "movements," cannot be discussed here, nor can France's fine modern sculptors, such as Maillol, and architects, such as Le Corbusier. (See also Impressionism, Surrealism, and articles on the individual painters.)

In general, however, it must always be borne in mind, when any facet of art in France is being considered, that more than in any other country in the world, art is there an industry, and the outstanding workers, no matter what their creed, are sooner or later enlisted to apply their own art for the good of the state, or for the uses of the general public.

## The SPEECH and WRITINGS of the FRENCH

*The finest instrument for the expression of thought is the French tongue, in which it is possible to state subtleties that are lost in other speech. This language, and what has been written in it, are discussed below.*

**France, LANGUAGE AND LITERATURE** OF Latin is the parent language of French, as it is of all the Romance Languages (*q v*). Traces of this parentage are clearly to be seen in the great numbers of words that have come directly from Latin. Such words as *père* ("father") from the Latin *pater*, and *mère* ("mother") from the Latin *mater* clearly show this origin. Latin derivatives like these, indeed, constitute the bulk of the French vocabulary. French words, in the main, are simply Latin words which have been modified by natural development.

Of the various dialects of Latin which sprang up over Europe during the early centuries of the Christian era, French was the first to be recognized as a separate language. By the 9th century the dialect spoken in the north and centre of what is now France, and that

spoken in the south, had undergone such marked differences that they were known by distinct names. The tongue (*langue*) of the south was called the *langue d'oc*, and that of the north the *langue d'oïl*, from the fact that "yes" in the south was *oc* and in the north *oïl*.

Out of the northern tongue has developed the French language of today, a language which yields to none in clearness and richness. Of both the language and the literature which has sprung from it, the first and sharpest impression that the student receives is indicated in the famous remark, "that which is not clear is not French." More can be tucked away, in a French sentence with less effort and less obscurity than in any other modern tongue.

Not that in French it is necessary to express all thought bluntly and crudely. Black must

## FRANCE LITERATURE

be black and white white, but there is much that is also grey, and for all fine variations of meaning, for delicate differences, French is the perfect tongue, because even in vague, cloudy matters, French must be clear. The very word *nuance*, by which the French indicate a subtle distinction, is used by us in default of an English equivalent.

But all this crystalline perfection, like every perfection, is bought at a price, and the price in this case is poetry, mystery, sentiment. For the French people, of whom the French language is the natural product and expression, are anything but mystical or sentimental, they are a logical, reasoning, realistic race.

This love for preciseness and clearness in literature is sharpened by the French social instinct. More than any other people, the French put the emphasis on society, less than any other do they interest themselves in the individual. For this reason they have a "social

literature," that is, a literature which concerns itself with matters of general social interest, rather than with the personal problems of the individual. Their writers remain within the illuminated circle of common experience, and seldom explore the uncommon, the mystic, the fantastic. Thus it happens they are sometimes charged with being unoriginal and even superficial, especially by certain German critics.

With these charges in mind, Ferdinand Brunetiere, one of the great modern French critics, has tartly replied: "The Frenchman piques himself on speaking clearly about matters which are sometimes profound, but the German seems to glorify himself too often on stating obscurely matters which are clear."

Brunetiere is right in contending that in depth French literature compares favourably with any other. But it has a depth of intelligence rather than of emotion, its fine distinctions are of thought rather than of feeling, its beauties are



**AN INCIDENT IN FROISSART'S 'CHRONICLES'**

Although Froissart, the early French historian, loved battles and chivalry and aristocratic things, he gives vivid descriptions of peasant rebellions in France and England. To him any such chaos of activity was part of life's drama. The period of anarchy in France following the Battle of Poitiers, 1356, gave him plenty of material of this kind. The lively illustration above from an old manuscript of Froissart's "Chronicles," shows French peasants of the Jacquerie being defeated by knights.



#### MOLIÈRE AT BREAKFAST WITH LOUIS XIV

There is a story that when the great dramatist, Molière, held a post in the household of Louis XIV the court officials refused to sit at breakfast with him because he was an actor. The king, appreciating Molière's genius and finding him breakfastless, invited him to join him at his own meal. When the courtiers entered they were astonished to see the actor at breakfast with Louis, for usually nobody was permitted to be present with the king at that meal. This illustration of the incident is from a painting by Jean Léon Gérôme.

more often of form than of content, its triumphs are analytical and concrete rather than poetical or visionary.

In view of such qualities as these in the French mind, it is, therefore, not surprising that French literature has gathered more laurels in prose than in poetry, whose very fabric is reverie, the intangible, the inscrutable. The French ardour for beauty of form has rendered their style of verse somewhat severe and rigid, though most graceful, elegant, and polished.

But in tasting French prose, we see how French clearness, French elegance, and French insight truly come into their own. In a world bitter with prejudice and flighty with wild dreams, the Frenchman seems able to see with clear eyes, to perceive with a cool heart. He is even exasperatingly right. If he does not sail among the stars, he does indeed "possess the mountain winds of truth."

Such have been the distinctions of French literature through a long history, that any brief account of it becomes little more than a roll call of world-famous names.

But before we come to the earliest of these names, those of the chroniclers Villehardouin, Joinville and Froissart, there is a vast mass of folk epics in verse, of lyric poetry, of mystery

and miracle plays, and of chronicles. As in all other literatures, verse preceded prose, and it was not until the 14th century that we find any considerable body of prose composition. This took the form of history, or chronicles, represented at their best by Froissart, the famous contemporary of Petrarch in Italy and Chaucer in England, who enriched and invigorated the French tongue, as Petrarch did Italian and Chaucer English. Soon after Froissart came Villon, the vagabond poet, whose hauntingly sweet and powerful lyrics stamp him as the greatest figure in French literature up to the time of the great men of the 16th century.

These creative geniuses—Rabelais, the jovial humorist and satirist, Montaigne, first of the essayists, Calvin, the luminous theologian, Ronsard, the elegant and original poet—these were the men who moulded the French tongue into much the form it has today, expanding its resources, and making it the pliable, powerful vehicle of one of the world's greatest literatures.

The French translation of the Bible, made in the 16th century, was a factor of weight in shaping the modern French language, just as the development of English, German, and other European tongues was vitally influenced by the popular versions of the Scriptures.

During the closing years of the 16th and the opening years of the 17th century, while Shakespeare was liberating English poetry from its dreary formalism and artificiality, Malherbe, poet and critic, was busy in France framing a rigid form and cramping tradition for French poetry. In the 17th century came also the first of the *salons*, or fashionable literary gatherings of Paris, and the establishment of the French Academy, two powerful factors in the cultivation of taste and a sense of literary form.

One of the golden ages in French literature was the long reign (1643 to 1715) of Louis XIV. During his heyday flourished the three dramatic giants Corneille, Racine, and Molière, the preacher Bossuet, that strange mixture of ultramontane clerical and mystical philosopher Fenelon, the 'saint' and savant Pascal, the poet and critic Boileau, the imitable letter-writer Madame de Sevigné, the wits La Rochefoucauld and La Bruyère, and many another.

#### Voltaire and Rousseau

Then came mocking Voltaire — sharply rational, gay, capricious, witty, chatty, vindictive, generous, 'the spoiled child of genius,' who attacked superstitions and social abuses on every hand and turned out scores of fat volumes, now mostly unread, which have been termed "a chaos of clear ideas." In his time he was "a founder of the future." His influence lay over all France until the advent of "the man from the Alps," the Swiss Jean Jacques Rousseau, who, amid the sceptical Voltairian atmosphere, "invented a new fashion in feeling," the first "back to Nature" movement. A vagabond and lackey, he voiced the ideas which produced the French Revolution and overthrew

the existing social order, half starved, cooped in a garret he lunched modern notions of hygiene and education.

The 18th century went out in the horror of the French Revolution. Diderot, joint editor of the great French "Encyclopédie", and Buffon the philosophic naturalist, died before the Revolution. Bernardin de Saint Pierre survived to produce his once popular "Paul and Virginia."

#### Advent of the 'Romantics'

The Revolution destroyed a world of formalism and fixed ideas, and raised the curtain on the modern age. The old classical rules of writing, such as the strict observance of the unities of time, place and action, were smashed along with political laws. Writers made new forms, used words in new and vivid ways. This new trend was known as "romanticism."

The acute and cynical Stendhal (Henri Beyle) when reproached for his romanticism, declared he held a lottery ticket for the year 1935. His fame did not delay so long, however. The warmth of Italy that swept through "La Chartreuse de Parme", and his skilful etching of complicated souls, had genius. Moreover Stendhal's romances held many elements of realism, just as the poet, Alfred de Vigny, romantic though he was, exhaled the cool breath of classicism.

Balzac and Hugo, Mérimée and Dumas and George Sand, were the true leaders of the romantic movement. The vast stage of living beings of Balzac dwelt in a world expressly made for them by Balzac. Hugo found no theme too dramatic, no tale too powerful, for his gifted pen. Mérimée introduced the use of "local colour," painting an exotic background, as in "Carmen."

George Sand lost herself in a morass of sentimentality, and Dumas the elder poured forth, in careless profusion, a flood of lively tales.

The poet Alfred de Musset wrote fervid and unpassioned lyrics, and Charles Baudelaire made great poetry of dark themes, Hugo said he gave the world "a new shiver." Théophile Gautier, who with his fellow romantics danced derisively around the bust of Racine to celebrate the new times, and supported Hugo at the production of his unconventional play "Hernani", wrote poems, novels and dramas of flawless excellence.

With Gustave Flaubert the new prose of realism was turned in French literature. Flaubert presented life in its true colours. He worked upon his prose like a sculptor of gems. His insight into character made the novel of incident seem trivial. Even more self-consciously realistic, or naturalistic



**VOLTAIRE'S HOUR OF TRIUMPH**

François Marie Arouet better known as Voltaire was the greatest French writer of his day and he excelled in every branch of literature. This contemporary engraving shows him being crowned with laurel at the Comédie Française, Paris, after the performance of his play 'Irene' in 1778.





ÉMILE ZOLA IN HIS STUDY

Émile Zola gained literary fame by his novels of stark realism dealing with the lower strata of French society. He will be remembered too for the remarkable campaign that he conducted to prove the innocence of Alfred Dreyfus (q.v.) the French Army officer wrongly convicted of treason. But Zola did not live to see Dreyfus completely rehabilitated.

were the Goncourt brothers who "wrote with their nerves," took notes on scenes in hospitals to get at the facts.

Dumas, the younger, a more careful workman than his famous father, wrote dramas re-creating a wayward world. He was far exceeded, however, by Émile Zola, leader of the "naturalists," who stirred up turgid social depths. Zola's own energetic temperament infused power into his tales of degradation though his dissidences, lack of proportion, and far from sculptural composition might well pain a reader of sensitive taste.

More typical of the French genius was Ernest Renan, gentle sceptic, brilliant historian, and stylist, as were also Hippolyte Taine, Émile Faguet and Ferdinand Brunetiere, all critics of widely recognized distinction.

Anatole France, the Modern Montaigne.

Anatole France, who recommended irony and pity as the best reply to modern life, has been likened to the great essayist, Montaigne, as having most delicately distilled a certain penetrating, smiling, disbelieving quality in the French spirit. Hussmans, however, was an uncompromising misanthrope, recording his hate of Mankind in several volumes before his conversion to religion changed his point of view.

Guy de Maupassant, genius of the short story, perfected condensation, cold analysis, and the bare, powerful style. Lover of the Orient and of the exotic, master of poetic prose, was Pierre Loti, whose slight plots served as frames to long, delightful travel sketches. Paul Bourget, in his long list of novels, opposed naturalism but borrowed its method, weighting his tale, however, with a heavy moral or sociological thesis.

Determined to present the spirit of France, Maurice Barres turned abruptly from the pure egoism of his earlier works, such as "*Le Culte du moi*," to an almost fanatical belief that "every living being is born of a race, a soil, an atmosphere, and genius manifests itself only in proportion as it is linked with its land and its dead." Barres was profoundly affected by German philosophy, and so likewise was Henri Bergson, a philosopher noted for his forceful charming prose. Bergson held that the true nature of things is revealed to us more by intuition than by reasoning. This idea, essentially un-French, has influenced 20th century French writers so widely as to give Bergson literary importance.

An unusual understanding and appreciation of German character appeared in the ten volume "*Jern-Christophe*" by Romain Rolland, whose freedom from national pre-

judices won him much harsh criticism. Rolland's masterpiece was as well known outside France as were the plays of his contemporary, Edmond Rostand, whose "*Cyrano de Bergerac*" and "*Chantecler*" delighted audiences in many lands.

Symbolism, which makes its appearance from time to time down the centuries in all literature, was rediscovered in France and elsewhere towards the end of the 19th century, particularly by the poets. Leader of the symbolists was Henri de Régnier, until he made an abrupt return to Greek traditions.

Quite the opposite was Francis Jammes. Simplicity, love of Nature and of animals, and a deep understanding of the character of the French peasant and provincial, brought him verities great popularity. His Catholicism was less austere, his poetic fire less brilliant, than that of Paul Claudel, dramatist and poet.

Thoroughly pagan and thoroughly modern was the poetry of the Comtesse de Noailles. A sophisticated mixture of discontented modern and of ancient Greek, she wrote of the rapture of love, the terror of death, of her search for beauty. A similarly pagan, love-lorn trend pervaded the novels of Pierre Louys.

Novels of Marcel Proust

Of all modern writers, Marcel Proust most deeply influenced world literature. This sensitive neurotic who lived for years in a cork-lined room knew the world more profoundly than the most bustling "man in the street." His thoughts trailed out in a filigree of elaborate sentences. He spread his consciousness out like a mist over the most banal scene, over the most shifting shade of the human soul. He was the



first and most convincing of writers to recognize that a man is not the same from moment to moment. His series "À la recherche du temps perdu" constitutes a whole world, a whole literature.

As distinguished as Proust, though less famous, was Paul Valéry, who succeeded to the place of Anatole France in the Académie Française. Because of his horror of facility, Valéry's slowly and carefully written volumes make but a thin package. In his work one feels that intelligence, like a keen steel blade, typical of French writing. His deep study of the human spirit, not as a social unit but as a lonely thing, is as fine, in a totally different way, as the slow brooding of Proust. Valéry was induced to publish his works by André Gide,

himself a deft writer, whose "L'Immoraliste" was a shrewd study of the Puritan conscience.

One of the best known of French War books was "Le Feu" (Under Fire) by Henri Barbusse, who did not surpass his War success. Jean Giraudoux, with "Lecture pour une ombre," and Henri de Montherlant, with "Le Songe,"

produced meritorious books on the War. Montherlant was typical of the younger men who revived the ideal of discipline and self-mastery.

Georges Duhamel opposed war in a number of effective short stories. The taint of decay left in Europe by the War was implied in the books of Paul Morand, who had a considerable success with "Ouvvert la nuit," as did André Maurois, a



**MARCEL PROUST**

In his novels he created characters so real that they seemed almost alive to the reader.

keen observer of English life and character, with his very popular "Les Silences du Colonel Bramble" and "Ariel," the life of Shelley. Jean Richard Bloch's "Et Cie" displayed a talent with the flavour of Balzac. He also wrote one of the best recent French plays, "Le dernier Empereur." François Mauriac, tortured by a sense of the evil nature of love, wrote bleak, powerful tales untrue to most



**ANATOLE FRANCE**

The novels of this great writer depict French life of the past and of his own day. Wielding a style of matchless lucidity, he wrote books tinged with irony and scepticism.

experience. Jean Cocteau, jaunty boulevardier possessed of considerable talent, had a certain quick success with poetry, novels, a ballet, and pen and ink sketching.

**Francis I, King of France (1494-1515)** The son of Charles, Count of Angoulême. Francis I was born September 12, 1494. His marriage at an early age to his cousin Cléopâtre, daughter of King Louis XII, and the death of that monarch without a son, brought Francis to the throne in 1515.

In his reign the Renaissance, which had begun in Italy, flowered in France. He fostered letters and art, invited printers and scholars to his kingdom, founded libraries, opened schools of the New Learning, and built several of the finest palaces in France.

Not content with building up his kingdom within, Francis sought also to extend its boundaries by engaging in a series of wars with the Emperor Charles V. His immediate object was to win Milan, the more distant aim was to reassert France's claims to supremacy throughout the Italian peninsula. These wars silted the greater part of Francis's reign, and left France exhausted. He won a great victory at Marignano in 1515, but failed at the Field of the Cloth of Gold in 1520 to secure the support of Henry VIII of England, and in 1525 was defeated at Pavia, taken prisoner, and forced to pay a huge ransom (1526). In 1529 he won certain concessions from Charles, whose sister he married in 1530.

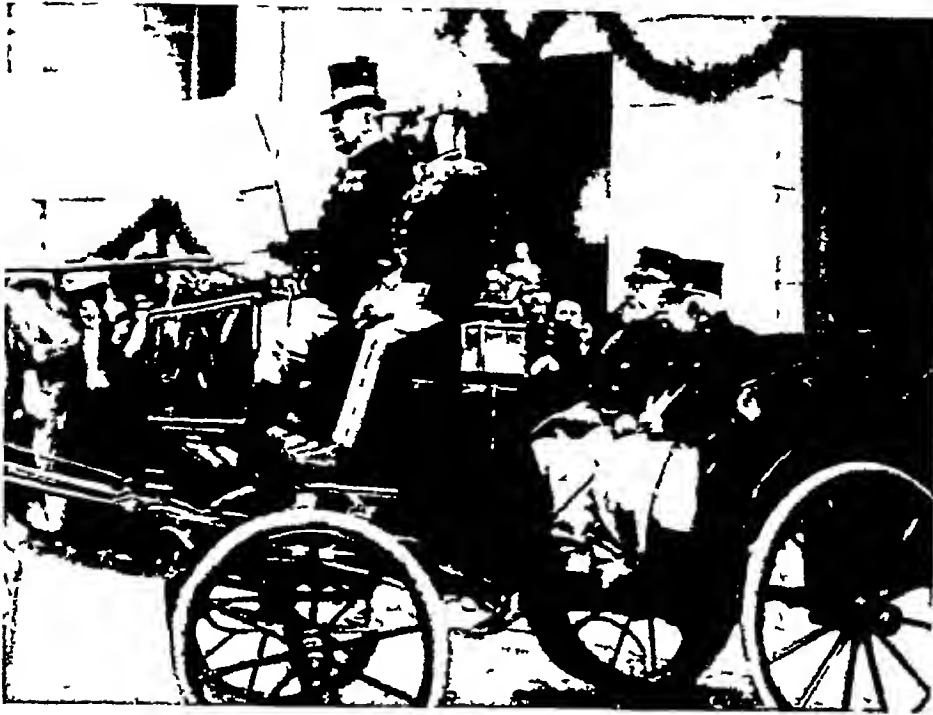
One unintended result of the long struggle over Italy was that Protestantism was given a chance to take root in Germany. In France also it found a fleeting foothold, only to be stamped out by Francis and his successors. The massacre in 1545 of the Waldenses or Vaudois, a heretical sect who had survived from the Middle Ages in the French Alps, left a black stain on the memory of Francis I. He died on March 31, 1547.

**Francis Joseph, Emperor of Austria and King of Hungary (1830-1916)** Francis Joseph ascended the Hapsburg throne in 1848 when his uncle, the weak-minded Emperor Ferdinand, was driven to abdicate by the more energetic Ferdinand, who swept his dominions. The uprising of the Czechs in Bohemia was put down by General Windischgrätz, who afterwards

## FRANCIS I OF FRANCE MEETS A FAMOUS ARTIST



Francis I, who ruled France from 1515 to 1547, has been described as the "king of the Renaissance." He loved pleasure and was an autocratic ruler, but he was a great patron of literature and art. When Benvenuto Cellini—the famous metal worker and sculptor—found that his turbulent conduct had made him unwelcome in Italy he made his way to France, where he was warmly welcomed by Francis I. Eventually Francis allowed Cellini to set up his workshop in the royal palace. This illustration shows Cellini exhibiting a specimen of his work to Francis.



FRANCIS JOSEPH AND KING EDWARD VII

The Emperor Francis Joseph was a close personal friend of King Edward VII, and during King Edward's annual visit to Austria to take the waters at Marienbad, the two monarchs used to meet for political conversations. The Emperor and King Edward are here seen driving together at Ischl, both are in Austrian military uniforms

Park

his only son by suicide and his wife by assassination, and popular sympathy inclined the more to him. It was often questioned whether the mother Hapsburgs would not fall apart with his death, and this threw the old emperor's considerable merits into higher relief.

Meanwhile, Austria had entered into close alliance with the German Empire, and together an ambitious policy was pursued in the Balkans and the Near East. The assassination of the Austrian heir apparent, Francis Ferdinand, and his wife at Sarajevo Bosnia on June 28, 1914, afforded a dramatic opportunity to strike the decisive blow which, in

bombarded Vienna into submission. Lombardy and Venetia were reconquered by Radetzky, following two defeats of their ally, Charles Albert of Sardinia-Piedmont. Finally Hungary, where the Magyars had proclaimed a republic under Kossuth, was crushed with the aid of a Russian army, and, until fresh violence again strained the seams of his patchwork empire, his German, Magyar, Slavic, and Italian subjects were ruled by a system of absolute despotism.

Austrian prestige suffered seriously in 1859 with the loss of Lombardy in war with France and Piedmont, in 1866 with the further loss of Venetia, and also of the leadership of the German states through defeat by Prussia. Hungarian discontent once more became dangerous, but this time prudent counsels prevailed.

The emperor in 1867 proclaimed a constitution by which the empire of Austria and the kingdom of Hungary became two equal and almost independent powers, united only by the person of their common sovereign and by a common administration of military, financial, and foreign affairs (the "Dual Monarchy"). Francis Joseph retained a large measure of personal control, but he never again openly repudiated constitutional government.

To his mastery of the many languages and dialects of his realm, as well as to his tact, generosity, and attractive manners, he owed a large measure of popularity. Personal misfortune again and again assailed him. He lost

the opinion of the German and Austrian emperors, would settle Balkan affairs once for all. But it was with great reluctance that Francis Joseph agreed to the harsh and ruthless terms of the ultimatum submitted to Serbia, and, subsequently, to the declaration of war. Francis Joseph died in 1916, and it was left to his grand nephew and successor Charles Francis, who abdicated in 1918, to see the break-up of the Hapsburg states.

**Francis of Assisi, SAINT** (Pronounced *a sē'-zē*) (c. 1182-1226) Saint Francis, the founder of the great order of the Franciscan Friars Minor, Minorites, or Grey Friars, and one of the most beautiful characters in all history, was born at Assisi, in central Italy, of a well-to-do family named Bernardone. A great change took place in Francis's life in his early twenties after a year's confinement as a prisoner of war and a serious illness. The old round of worldly pleasure and display no longer appealed to him; he sold his property in order to give to the Church, and began to tend the poor.

This conduct angered his father, and he disinherited his son. Then Francis, wearing an old cloak, occupied himself with repairing, tumble down churches and chapels round Assisi. At last, throwing aside even his stick, wallet and shoes like the apostles of old, he lived in absolute poverty.

Soon this saintly man began to attract followers. In grey habits, barefoot, and with

out money, they went forth two by two to spread the gospel of service and divine poverty through central Italy. When he had a dozen followers, Francis received Pope Innocent III's sanction to continue his work. Later, as the "Begging Brothers" grew very numerous, the Pope began to give them many privileges.

#### Friars Pledged to Poverty

The humble founder, fearing lest his order should become ambitious and powerful, drew up a rigid rule showing how "in poverty and humility serving God" they should remain absolutely possessionless, and should confidently seek alms and minister to the poor and sick. When a girl of eighteen named Clare left her home to become a follower of Francis, he instituted a separate order for women known as the Franciscan Nuns, or Poor Clares.

For the rest of his life "little brother Francis," as he called himself, continued his labours.

He made long missionary journeys, even seeking martyrdom in the lands of the Mahomedans. He gathered many new followers, had visions, and performed a number of miracles.

A legend has come down to us of his preaching to the birds, telling them how thankful they should be to God, their creator. He was a poet, too, and his lyric lines are very touching and beautiful. The "Little Flowers of St. Francis" have been the delight during seven centuries of all in whose way they have come. In these sketches of the life of the earliest Franciscan friars the simplicity, the gaiety, the exquisitely poetical imagination of "the little poor man" (*Il Poverello*) shine forth with the happiest light.

At his death it is said that on his body were found the "stigmata"—the marks of the five wounds of Christ, in the hands, feet, and side. Two years later he was canonized. He is lovingly remembered as the most blameless and gentle of all saints, the most Christ-like figure of the Middle Ages.

#### Franco-Prussian War (1870-71)

The cry "On to Berlin!" echoed and re-echoed through the streets of Paris in the exciting days at the beginning of the

Franco-Prussian War in July 1870. For four years, ever since Prussia had defeated Austria and won the leadership in Germany in 1866, the leaders of the Second French Empire had longed to humiliate this upstart country or to obtain "compensation" for its rise in power.

For four years the Prussian rulers, too, had wanted war with France. Bismarck, the Iron Chancellor, was convinced that such a conflict was necessary before the unification of Germany could be completed, and he rejoiced when his scheme of altering the "Ems dispatch" before publishing it led France to declare war (*see* Bismarck, Otto von). The occasion of the war was the offer by the Spaniards of their vacant throne to a German Hohenzollern prince, distantly related to the Prussian King, William I. The offer was refused for political reasons. Then came the blundering demand of France on the Prussian king that he should guarantee



ST FRANCIS OF ASSISI PREACHING TO THE BIRDS

St. Francis spent the later years of his life as a penniless itinerant preacher. He loved Nature and all animals, and a pretty legend says that he even preached to the birds. This story has been immortalized by the genius of Giotto in one of his frescoes in the church of St. Francesco at Assisi, reproduced above. St. Francis was the founder of the grey gowned order of Franciscans.

## FRANCO-PRUSSIAN WAR

that his relative should never accept it, and Bismarck's deception brought the war-spirit in both countries to fever heat.

"Everything is ready," declared the French minister of war, "to the last button on the last garter." But when the French troops began to mobilize, it was found that hardly anything was ready. There were horses without harness, cannon without ammunition, new-pattern guns without men who knew how to use them. Prussia, on the other hand, had been completely prepared by General von Moltke. The plan for the invasion of France had been formed long before. France, moreover, stood

a battle that resulted in the surrender of the largest army ever known to have been taken in the field, a battle that dethroned a dynasty and changed the government of France. On September 2 the French army of nearly 82,000 men, with the Emperor Napoleon III himself surrendered as prisoners of war.

Such a terrible disaster to France astonished the whole world. The early defeats of August had been announced by the government as victories, but the deception could no longer be kept up. When Napoleon's message—"The army has been defeated and is captive, I myself am a prisoner"—arrived in Paris the mob began to cry "Down with the Empire! Long live the Republic!" The Empress Eugenie fled, a republic was proclaimed, and a Government of National Defence was organized.

For five months longer this provisional government carried on the hopeless struggle. It was ready for peace, but was resolved that "not an inch of our soil will we cede, not a stone of our fortresses." After Sedan the Germans hastened on to Paris, and on September 19, 1870, began the famous siege of that city. For four months the capital bravely held out.

Early in the siege the fiery Leon Gambetta, head of the new government, escaped from the city in a balloon, and worked desperately to raise new armies. But there was no possibility that they could break through the circle of iron around the doomed city. The sufferings of the Parisians during the siege were terrible. Dogs and cats were eaten. The price of rat-rose to half-a-crown a piece. Fuel gave out. Only when starvation was upon it did the city surrender (January 28, 1871). A government recognized by Germany was formed, with the aged statesman Thiers at its head, and peace was made with Germany (Peace of Frankfurt, May 10, 1871). The victors

demanding harsh terms. The greater part of Alsace and Lorraine was to be given them. An indemnity of £200,000,000 was to be paid and until it was paid a German army was to remain in France. France was humiliated by the German troops marching in triumph through Paris, and by the proclamation at Versailles of the new German Empire.

Next there occurred a desperate revolt in the city against the new government. The Parisian working men rebelled and set up a government called the "Commune." The revolt broke out on March 18 and it lasted until nearly the end of May. Again the



**NAPOLÉON III SURRENDERS**

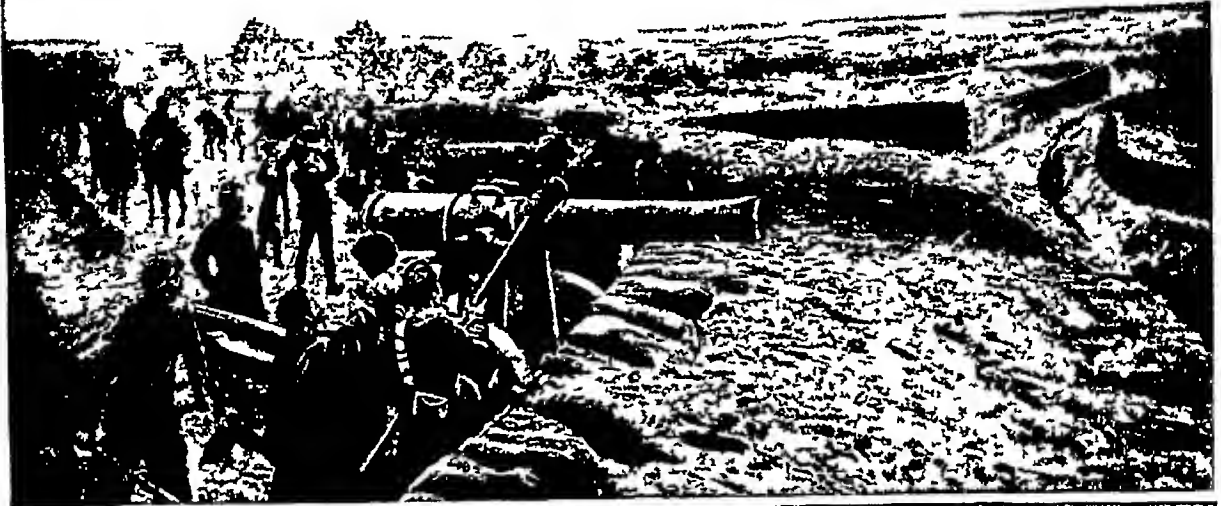
On September 2, 1870, the army of Napoleon III was defeated and surrounded at the battle of Sedan and the Emperor with 82,000 of his troops were taken prisoners. This illustration shows the Emperor surrendering his sword to the King of Prussia afterwards the Emperor William I, at the château at Bellevue. The King of Prussia is seen in the centre and on the right is his son the Crown Prince Frederick, later the Emperor Frederick.

alone without a single ally, while the South German states and the North German Confederation rushed to the aid of Prussia.

In an astonishingly short time after war was declared (July 19, 1870), German troops invaded France in Alsace and Lorraine. The French troops met them as best they could, and, though they fought bravely, they were defeated in one battle after another between August 6 and September 2. One of their armies was shut up in the strongly fortified city of Metz, while the other on September 1 was fighting before Sedan. This proved to be "one of the decisive battles of the world—



## IN PARIS DURING THE FRANCO-PRUSSIAN WAR



In the autumn of 1870 the victorious Prussian army marched through France and laid siege to Paris. The city held out from September 20, 1870, until the end of January, 1871. The defending garrison, some of whom are seen above manning the guns of the earthworks, made a heroic defence, but as the only means of communication with the outside world was by balloon the sufferings were intense. After the German Army had withdrawn from Paris a revolt against the Government, known as the "Commune," broke out, and ended in a short but sanguinary civil war in the city. In the lower picture an artist has depicted a scene in the streets of Paris during this unhappy conflict.



## FRANKFORT

city was besieged, but this time by the French troops of Thiers. When the government troops entered the city there followed a week of fierce civil war. Indeed, Paris suffered more from the Commune than from the Germans.

**Frankfort, GERMANY** There are two important cities named Frankfort (or Frankfurt) in Germany. One, Frankfort-on-the-Oder, lies 50 miles east of Berlin, the other is Frankfort-on-the-Main, a great commercial centre in the Rhine basin with a history dating from the time of Charlemagne.

Its name is derived, some say, from the occasion when the Franks under Clovis forded the Main when on a punitive expedition against the Germans. The "Golden Bull" of the Emperor Charles IV, dated 1356, made Frankfort the electoral city of the Holy Roman Empire. From



German State Railways

### RIVER-FRONT OF FRANKFORT-ON-MAIN

All the principal buildings of the city of Frankfort-on-Main are situated on the right bank of the river, and the river-front is here seen from the left bank beneath one of the arches of the bridge. On the right can be seen the tower of the Rathaus and on the left the Leonhards kirche dating from 1219 and said to stand on the site of Charlemagne's palace.

1815-1866 it was the seat of the Diet of the German Confederation.

The chief buildings standing today are the cathedral, much of which dates from the 14th century, the one time town hall in the marketplace, and the house where Goethe was born.

The home of the first of the famous Rothschild family of bankers may still be seen in the Jewish quarter. From this small money-lending establishment, grew one of the greatest financial houses the world has ever known.

Frankfort is an important road and railway junction. In addition to being a banking centre, the city carries on a large trade in chemicals (the headquarters of the huge I.G. Farbenindustrie trust is here), machinery, book publishing, and all manner of other things—including the

## FRANKLIN

savoury Frankfurter sausage. Frankfort's educational facilities were extended in 1914 when a university was opened. Population 550,000.

**Franklin, BENJAMIN (1706-1791)** The Franklins were small landed proprietors or tradesmen in Northamptonshire, simple industrious pious. The father emigrated to Boston Massachusetts U.S.A., about 1685, and set up in business as a candle moulder and soap boiler. His 15th child, who was born January 17, 1706, was taken to the Old South Church christened Benjamin, and dedicated to the ministry. Lack of money for the necessary education forced the boy to learn the printer's trade. At seventeen he ran away to Philadelphia. He landed with four shillings a trade, and plenty of "push."

At twenty-three he owned a printing office and was publishing the "Pennsylvania Gazette."

For the next twenty years he was the foremost journalist in the colonies. "Poor Richard's Almanac," issued annually for a quarter of a century, made him known from city mansion to the remotest frontier cabin. While making fame and fortune as a printer, publisher, and writer, he was studying foreign languages and literatures, experimenting in science, and taking a conspicuous part in local affairs. From 1736 when he was chosen clerk of the Pennsylvania General Assembly, until 1753 when he returned from Paris at the

close of the American Revolution, he was almost continually in the public service. Although his early plans for a union of the colonies presented at the Albany Congress failed, as Deputy Postmaster General under the Crown for twenty years he linked them together with the ties of the postal service.

After 1747 Franklin spent over a quarter of a century more or less continuously abroad in the service of his country. His discovery of the identity of lightning and electricity had already made him the best known American in Europe (See Electricity). Learned societies and universities welcomed him, and he soon won equal distinction as a diplomat. Sixteen years in all he spent in London as the agent of the colonies. His chief triumph was in getting the Stamp

# BENJAMIN FRANKLIN OF THE BUSY BRAIN



That sturdy Ben Franklin, the soap-boller's son, who is stirring the big soap kettle in the first picture, is the same Franklin whose genial wit and shrewd comments on life made him a social favourite among the aristocratic ladies of Paris, as shown in the last picture in the series. At 20 we see him as a printer looking over one of the sheets which have just come from the old hand-press. At 25 he is in the newspaper business and his comments on public affairs are being widely read. In the centre picture we see him in his library—thumb under chin his regular attitude when reflecting. On the left of this picture he is making experiments with electricity, on the right he is testing the temperature of the Gulf Stream from the deck of the vessel which is carrying him to England. Next we see him taking part in the peace negotiations which ended the American Revolution.

## FRANKLIN

Act repealed An eminent English statesman once said that, had the king and Parliament accepted Franklin's just contention that the American colonies were self-governing, owing allegiance only to the sovereign, the Revolutionary War might never have been fought

Franklin, after more than a decade of working in vain for agreement between the Mother Country and the colonies, returned to help Congress to draft the Declaration of Independence, and to place £4,000 of his fortune at the service of Congress He then crossed the sea once more, in December, 1776, to win the help of France to the cause of American liberty His position in Paris, although he represented poor rebel colonies, was most influential, such as has rarely been equalled in the history of diplomacy

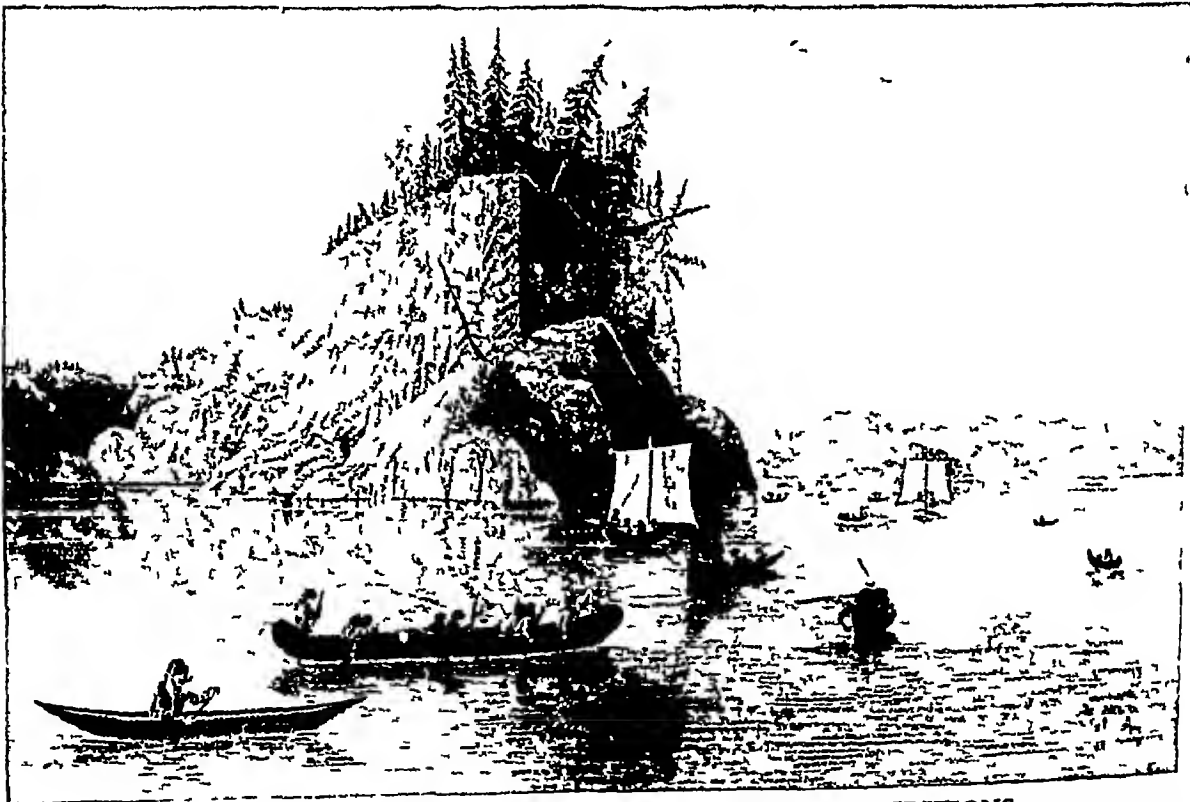
When Franklin returned to America in 1785, he was in his eightieth year, and begged for rest He could not, however, decline the office of chief executive of Pennsylvania, or membership in the Constitutional Convention of 1787 that drafted the Federal constitution In spite of the infirmities of age, he continued to give scientific discoveries to the world His last public act was to affix his signature to a memorial to the state legislature, as president of the Pennsylvania Society for the Abolition of Negro Slavery

No life of Franklin is comparable to his own autobiography As literature it is a classic, and as a human document it is unsurpassed Benjamin died in Philadelphia, April 17, 1790

**Franklin, Sir JOHN (1786-1847)** Today we are all so accustomed to hearing about and seeing pictures of the North Pole, over which fly aeroplanes winging their way from Europe to America, and on which a permanent meteorological station is now established, that we find it difficult to appreciate the courage, fortitude and endurance of those early explorers in Arctic seas who first endeavoured to reach it Among these great pioneers the name of Franklin holds high place

Born April 16, 1786, at Spilsby, Lincolnshire, Franklin, after serving in the Navy—he was present as a midshipman at the battle of Copenhagen in 1801—made three expeditions to the Arctic, in which he surveyed many thousands of miles of North American coast line, as well as the Mackenzie river basin

Then on May 19, 1845, he sailed from the Thames in search of the "North-west Passage" His ships were sighted in Baffin Bay, and then disappeared No fewer than thirty nine successive expeditions went in search of him, but nothing further was heard of Franklin and his gallant men, beyond the discovery in April,



**SIR JOHN FRANKLIN ON ONE OF HIS EARLY EXPEDITIONS**

Between 1818 and 1827 Sir John Franklin led three expeditions to explore the extreme north of the American continent. In this illustration his party, with an escort of seventeen Indian canoes, are seen crossing Lake Prosperous on May 30, 1820 The general object of this first expedition was to explore the coast line The explorers suffered great privations, often they had no food at all, and they were even reduced to eating old shoes

1859, by an expedition promoted by Lady Franklin, of a cairn at Point Victory in which was a record of Sir John's expedition down to April 25, 1848, with definite proof that he had discovered the North west Passage, and that he had died on June 11, 1847

**Frazer, SIR JAMES GEORGE** This great scholar was born in Glasgow on January 1, 1854, and after attending Glasgow University continued his studies at Trinity College, Cambridge. His first love was for the classics, but he was soon attracted to the study of anthropology and folklore, with which his name has ever since been associated.

His most famous work, "The Golden Bough," was originally published in two volumes in 1890, but has since been expanded to twelve volumes and a Supplement. The original purpose of the work was to investigate a curious custom mentioned by Virgil, connected with the worship of Diana at the Lake of Nemi, where grew the Golden Bough which gives the book its name. In the course of his investigations Frazer was drawn to seek for similar customs and possible explanations among many other peoples, so that the work contains an amazing amount of information about primitive races in all parts of the world. No less striking than its learning is the majestic prose with

which the author maintains the interest of his readers throughout his long work, reviving them from time to time with passages of great eloquence. By reason of both its matter and its style, "The Golden Bough" has been described as one of the great products of the human mind, and its influence upon thought has been immense. The book discusses and explains many customs and superstitions besides that with which it principally deals, and one result of reading the work is to make the reader acutely aware of the extent to which his thoughts and beliefs are inherited from his primitive ancestors.

"The Golden Bough" has been only one of several great works from Sir James Frazer's pen. In "Totemism and Exogamy" (1910) he devoted four large volumes to the old custom of marrying outside one's own family, which is widely found among savage races. In "Folklore in the Old Testament" (1918) he described many primitive customs found among the Hebrew people, and by citing instances of similar customs among other peoples showed that they were part of the heritage of the human race, and not peculiar to the Jews.

He has maintained his interest in the classics, and has translated and edited the writings of the Greek author Pausanias, and Ovid's "Fasti."

## The Legend of the Golden Bough

ABOUT sixteen miles from Rome, in the Alban Hills, occupying what was once the crater of a volcano, is Lake Nemi. It is about 3½ miles in diameter, and from its sides hills, stone-clad in part, rise precipitously to a height of over 300 feet. The whole scene—the lake, the steep hills, and the trees—is remarkable for its picturesque beauty, and suggests peace and tranquility. Near by is the village of Aricia.

In ancient times the lake was associated with the worship of the goddess Diana, and there were a grove and a temple upon its banks that were sacred to her. She was worshipped here with harvest festivals as the deity who gave fruitfulness, and with a torchlight procession as being the goddess of light. She was often identified with the moon, and the Lake of Nemi was sometimes called the "Mirror of Diana," doubtless because the moon was often reflected in the placid waters of the lake.

The priest or guardian of Diana's shrine was a gladiator or fugitive slave, and on moonlight nights he might have been seen creeping stealthily among the trees. He walked in terror of his life, for, by a curious rule, if any other slave could take a twig from a mistletoe bough growing on an oak in the grove and slay the guardian of the shrine (or "king of the wood," as he was also called), he would become king in his place.

Macaulay has graphically described the scene in his poem on "The Battle of the Lake Regillus."

From the still glassy lake that sleeps  
Beneath Aricia's trees—  
Those trees in whose dim shadow  
The ghastly priest doth reign,  
The priest who slew the slayer,  
And shall himself be slain.

The origin of this curious priesthood was for long a puzzle to scholars, but Sir James Frazer (see above) in his "The Golden Bough" has pointed out similar customs in other parts of the world which throw considerable light upon the problem. For example, in many parts, especially in Africa, kings reign only for a definite period, or until their powers begin to fail, and are then put to death. The reason for this is that the king is worshipped as something of a god, and is thought to be the source of rain and the crops, so that his people fear infirmities in him lest he prove unable to supply them with food. They prefer, therefore, to put him to death while his powers are unimpaired. So "the king of the wood" at Nemi may have been regarded as the incarnation of the spirit of the forest, and this curious rule of succession was instituted in order to make sure that the person who held the post should always be virile. Then again, oak trees were highly regarded by the early Latins and by kindred people, such



### WHERE GREW 'THE GOLDEN BOUGH' OF FRAZER'S MASTERPIECE

At the Lake of Nemi, not far from Rome, grew the "Golden Bough," supposed to have been a mistletoe branch, which in antiquity was guarded by a priest with his very life. The strange custom inspired poets like Virgil to write about it, scholars like Sir James Frazer to investigate its origin, and artists like Turner to depict the scene. In this picture Turner has painted the Lake of Nemi in its wild mountainous setting with a symbolic figure in the foreground holding up a branch—"The Golden Bough."

*Tate Gallery photo Mansell*

as our own ancestors, the Celts. This may be due to the fact that oak trees are more often struck by lightning than other trees, and lightning has always been feared as an instrument of divine wrath. And it may be that a mistletoe bough has somewhere taken root upon a tree struck by lightning. What would be more natural for simple and credulous people to believe than that it was planted there by the lightning, and that the plant itself was therefore divine? Certainly mistletoe—the Golden Bough—was highly revered by the Druids, who cut slips from it ceremonially with golden knives each year, and in Scandinavian mythology the hero Balder was impervious to all else, and could be wounded by the mistletoe alone. Even in our own day it retains some slight fragment of its ancient reverence, for no one would dream of celebrating Christmas without it.

**FREDERICK.** EMPERORS OF THE HOLY ROMAN EMPIRE. During the Middle Ages three rulers of the Holy Roman Empire (*qv*) bore the name of Frederick.

**FREDERICK I (BARBAROSSA)**, (c. 1124–1190), of the German house of Hohenstaufen, ruled from 1152, and was in many respects the ideal emperor of the Middle Ages. His red beard led the Italians to nickname him "Barbarossa." His ambition was to restore the position of the

Roman Empire to the place it had occupied under Charlemagne and Otto the Great.

But times had changed since the days of Charlemagne. Frederick had the strong city



**FREDERICK I**

This relief at Reichenhall, Bavaria, shows the emperor known as Barbarossa (from the redness of his beard).

republics to contend with in Italy, and furthermore the Pope was playing a larger part in European affairs than was formerly the case. In his attempt to govern the Italian towns, Frederick was eventually defeated by the Lombard League of northern Italy. These cities were henceforth practically independent. Frederick was likewise unsuccessful in his contest with the Pope, and was forced to humble himself before the head of the Church (1177), much as Henry IV had done at Canossa just one hundred years before.



## FREDERICK

In Germany, however, Frederick was more successful than in Italy, and his reign marks one of the most brilliant epochs in the history of medieval Germany. He established his power over the turbulent and troublesome German nobles. The land was then cleared of forests, agriculture was improved, and the country advanced in wealth and in culture.

Towards the end of his reign Frederick joined the Third Crusade, but before he reached the Holy Land he was drowned in a little stream in Asia Minor, June 10, 1190.

**FREDERICK II** (1194-1250), the grandson of Frederick Barbarossa, was born December 26, 1194, and on the death of his mother in 1198

he inherited the kingdom of Sicily under the regency of Pope Innocent III. He was crowned German king in 1215, and Emperor of the Holy Roman Empire in 1220. He was known as "the wonder of the world" because of his varied attainments. He wrote sonnets and was the author of a treatise on falconry, had a knowledge of six languages, of mathematics, philosophy, architecture and other sciences, founded the University of Naples in 1224, and furthered the progress of the medical school at Salerno.

His court in Sicily, where he spent most of his life—largely under Saracen influence—was the most splendid in Europe, and a centre of intellectual activity. But he neglected Germany in order to defend himself against the Pope in Italy. The nobles and the towns north of the Alps came to exercise rights which belonged to the emperor, and Germany grew more and more into a confused mosaic of city states and feudal principalities. Frederick's Crusade (1228-29) was a mere episode in his conflict with the Pope.

Frederick was able to maintain his power until his death, but soon after, the triumphant papacy overthrew, with French aid, the whole Hohenstaufen house, root and branch.

**FREDERICK III** (1415-1493) was the senior member of the Hapsburg house. His reign has been called "the longest and dullest of all the reigns in German history." He was listless and incapable as a ruler. All he could do was to watch the course of events, consoling himself with botany, alchemy and astronomy. One thing he accomplished which left a lasting impression on history: a marriage treaty was made with Hungary by which that kingdom eventually became a Hapsburg possession. Frederick thus began that policy of "fortunate marriages" which built up the power of the Hapsburgs.

**Frederick the Great, KING OF PRUSSIA** (1712-1786) Frederick II, future King of Prussia, had a hard time when a boy. His father, rough old Frederick William I, planned an education for his heir that was military, practical, matter-of-fact. But the boy was fond of music, literature—especially French—and art. He hated military exercises; he would rather play the flute than play the soldier; he detested tobacco, heavy eating and drinking, and hunting, all of which appeared to his father as manly and royal pleasures. The king forbade the prince's tutors to teach him Latin because it "had no practical use", but Frederick studied the classics when his father's back was turned.

As Frederick became older he thought that this youth would one day be king and would probably wreck the Prussian state by his incompetence, enraged the tyrannical, hard-working Frederick William, who thought only of Prussia's greatness. He became more and



**FREDERICK III MEETING HIS BRIDE**

The Emperor Frederick III was crowned in Rome in March, 1452, three days after his marriage to Leonora, daughter of Edward, king of Portugal. Aeneas Sylvius, then Bishop of Siena and afterwards Pope Pius II, presented the bride to the bridegroom, as shown in this picture, one of Pinturicchio's illustrations to the life of Aeneas Sylvius.



## FREDERICK

more severe with his son, even caning him and boxing his ears in public

When Frederick was eighteen he decided to run away, but he was caught before he crossed the border. He was kept in solitary confinement for a time, and from the window of his cell he was forced to watch the execution of his most intimate friend who had accompanied him in his flight. For a time the enraged king even thought of executing his son as a military deserter.

After this, Frederick changed. He became self-contained, crafty and cynical, but sobered and outwardly submissive. He spent several years in learning the dry details of administration. Gradually he bore greater responsibilities.

When he came to the throne at the age of twenty-eight, Frederick had a keen mind, a character of iron, and an ambition that was soon to set the world on fire. He ruled for forty-six years, of which the first twenty-three years were devoted chiefly to unscrupulous warfare, and the second to peace and recovery.

### Warrior and Despot

The first half of his reign made it evident that as a soldier he had no equal in Europe; the second half showed him as one of the enlightened despots of the 18th century. Frederick worked hard himself, rising at 3 o'clock in the summer and at 4 in the winter. But in his leisure hours he wrote poetry and history, and he brought the French philosopher Voltaire to his palace.

This man, who as a youth had hated the life of a soldier, plunged all Europe into war immediately after he came to the throne. He seized the rich Austrian province of Silesia and so began a great European conflict. It was in this struggle that his military genius won him the title "the Great." During his reign he nearly doubled the size of his kingdom, for he not only compelled Maria Theresa to cede Silesia to him, but also seized part of Poland in 1772.

In peace he vastly increased its resources by draining marshes, clearing forests, encouraging industries, opening schools. He reorganized the army, replenished the public treasury, and remodelled the legal code.

Frederick raised Prussia to the rank of one of the first powers in Europe, and by his military successes and his crafty diplomacy gave it the stamp of his own character. Strangely enough, this greatest of the Hohenzollerns spoke and wrote French almost exclusively. He died on the eve of the French Revolution, and so he was in a sense the last absolute king in western Europe.

**Free Churches.** In the stormy days of the Reformation there were many religious people who were dissatisfied with the close connexion of Church and State that ensued upon the breaking of the ancient ties with Rome. In England in particular there were many who objected to the "establishment" of the Church,

## FREE CHURCHES

because they feared that the State would interfere with the individual's liberty of conscience and of worship. Already in Queen Elizabeth's time we read of "sectaries" who broke away from the national Church and formed themselves into little groups determined to worship God in their own way. Some of the earliest of these were the Brownists, so called from the name of one of their leaders, Robert Brown (c 1550-1633). Each Brownist community or congregation was independent of all other Churches or congregations, and hence the religious communities established on these lines have been called Independents, or, to use the modern term, Congregationalists.

Another of the Free Churches—free in the sense that they are self-governing and do not acknowledge the authority of the king or Parliament in religious matters—are the Baptists, who also date from soon after the outbreak of the Reformation. The distinctive practice of the Baptists is adult baptism by total immersion, as opposed to the infant baptism practised by most other Christian bodies; they claim scriptural authority for their practice in that Christ was an adult when He was baptized.

Presbyterians also arose in the 16th century, when the doctrine and government of their Church were decided by such great reformers as John Knox in Scotland and John Calvin in Geneva. They are called Presbyterians because their churches are governed by elders, the Greek word for which is *presbuteros*. Presbyterian churches are rather more closely linked together than Baptists and Congregationalists, though in recent years these, too, have shown marked signs of a desire for co-operation and union.

### Methodism's First Place

The largest of the Free Churches is the Methodist, which dates from the 18th century, when John Wesley, his brother Charles, and George Whitefield, by their fervid preaching and untiring labours, revolutionized the religious life of the country. Until recently there were three principal Methodist Churches in Britain, but in 1932 they were all combined into one Church.

Amongst the other Free Churches may be mentioned the Society of Friends, better known as Quakers, who have no paid ministers and are remarkable for their whole-hearted opposition to war and force generally; the Christian Scientists, whose teachings are largely based on the writings of an American lady, Mrs Mary Baker Eddy (1821-1910) (*qv*), the Plymouth Brethren, a body of ardent evangelicals whose first congregation was founded at Plymouth in 1830, and the Unitarians, who do not believe in the divinity of Christ. An organization akin to the Free Churches is the Salvation Army. Free Churchmen are often called Nonconformists because in 1662 their spiritual ancestors

## FREDERICK THE GREAT ON THE EVE OF BATTLE



In 1760 the Prussian army marching towards Silesia was in a desperate plight. With but 30,000 men against the 140,000 men of the Austrians and Russians, the troops of Frederick were almost completely surrounded, and their royal leader viewed the position with grave misgiving. In the battle that ensued at Liegnitz, however, on the night of August 14, 1760, the Prussians gained a splendid success against the Austrians, who were completely overwhelmed. Frederick is here seen on the eve of the battle making his plans.

## FREE CHURCHES

refused to conform to the fresh settlement of the Church that followed the Restoration. Another name, seldom met with nowadays, is Dissenters.

In England today Free Churchmen number some 5,700,000. The membership of the principal churches in 1931 was as follows: Methodists, 2,800,000; Congregationalists, 1,020,000; Baptists, 890,000; Presbyterians, 500,000.

In Wales the majority of the people are Nonconformists. In Scotland the greater part are Presbyterians, though they are not Free Churchmen, for in the northern kingdom Presbyterianism is established by law.

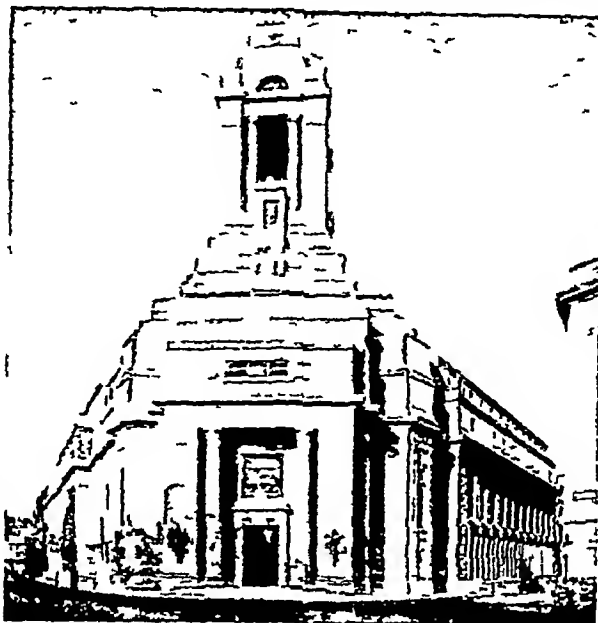
The Free Churches are famed for their missionary zeal, and they maintain many hundreds of missions. David Livingstone, the African explorer-missionary, and William Carey, the Northamptonshire shoemaker who went to India as a missionary in 1793, were both Nonconformists.

**Freemasonry.** No one knows how or where the secret society known as the Free and Accepted Masons really began, and there are various traditions about it. Many of its ceremonies and practices have a striking affinity with the ceremonies and ritual of the Eleusinian, Samothracian, Dionysian, and other ancient mysteries, as well as with the most ancient religious ceremonies known, particularly the initiatory rites and ceremonial proved to have prevailed among Indian races, the Druids, etc. It is said to have arisen from guilds of masons or stone-workers, which sprang into being in the Middle Ages, in order that travelling members might be accepted by their brother craftsmen. They made use of secret signs and passwords. Other stories, with little warrant, carry the origin of the order back to the building of the temple at Jerusalem in the days of Solomon.

Scotland possesses the earliest record of the presence of masons in lodges. Edinburgh Lodge No. 1 has record books dating from 1599, but these do not record the beginning of the lodge. The famous Kilwinning Lodge is also claimed to have been in existence at that date as a governing body, but its minute books date only from 1642. Modern freemasonry, with the three

## FREEZING

symbolic degrees (apprentice, fellow-craft, and master-mason) dates from the early 18th century. The organization of the Grand Lodge of England was effected in 1717, by the union of four lodges then meeting in London. The Grand Lodge of Ireland was formed in 1729, and the Grand Lodge of Scotland in 1736.



Larkin Bros  
**LONDON'S MASONIC TEMPLE**

The new headquarters of British Freemasonry, near Kingsway, is one of the finest buildings in the metropolis. The tower is 200 feet high. In this great building many "lodges" hold their meetings.

The many Masonic rites are now largely combined into the English, Scottish, French, American and Swedish rites. These rites variously combine the degrees and ceremonies. In all, the emphasis is on the member's duty to his family, his country, and his God, and to aid his fellow members. A set of passwords and a peculiar grip of the hand enable the initiated to recognize one another.

Freemasonry the world over is noted for its benevolent activities. In England there are three well known institutions—the Royal Masonic Institution for Girls, founded in 1788, which has a senior

school at Rickmansworth, Herts, with a junior school and convalescent home at Weybridge, Surrey, the Royal Masonic Institution for Boys, at Bushey, Herts, founded in 1798, and the Royal Masonic Benevolent Institution for Aged Freemasons and the Widows of Freemasons at Croydon. In 1932 a hospital for freemasons was opened at Ravenscourt Park. The British headquarters of freemasonry is in Great Queen Street, Kingsway, London.

**Freezing.** If you mix some cracked ice or snow with a couple of handfuls of salt in a bucket and stand a test-tube of water in it, you will notice that a thermometer placed in the water will fall slowly until it registers 32° F. At that point the water in the test-tube will begin to freeze and the temperature will remain unchanged until all the water has turned into ice. Thus you can say that the freezing point of water is 32° F.

A great many other substances, like water, may be frozen or changed into the solid form. Another point is that the temperature of melting ice does not change until all the ice has been changed to water. All the time the melting process is going on, the ice is absorbing heat from surrounding objects. It is on this principle

that refrigerators work. Salt absorbs water very readily, even from ice, thereby melting it and forming a salt solution, or brine. This is why we scatter salt and sand on the streets in frosty weather, the salt melts the ice and the sand prevents slipping.

But the freezing point of saturated brine is about  $-7^{\circ}\text{F}$ , or 39 degrees below the freezing point of water. Thus we can easily see why, as the ice melts by absorbing heat, the brine becomes so very cold, and why a freezing mixture of salt and ice is used in making ice cream and artificial ice. The freezing-point of a solution of calcium chloride is even lower, so this substance is also much used in domestic refrigeration. The lowest possible temperature is the "absolute zero" of  $-273^{\circ}\text{C}$ . At this temperature a body would possess absolutely no heat and retain none of its properties. By the method of liquefaction of gases in a magnetic field, British scientists have produced a temperature of  $-272.9956^{\circ}\text{C}$ . But attainment of the "absolute zero" is impossible because  $-273^{\circ}\text{C}$  is, like the speed (186,000 miles per second) of light, a "critical" standard.

In the case of crystalline substances, such as ice and many metals, the melting- and freezing points are the same. Non-crystalline substances, like wax, butter, glass, and iron, do

not have a definite melting and freezing-point. As heat is applied to them in their solid form they gradually soften, becoming first like a very thick liquid, and finally flow freely.

#### Why Pipes Burst in Winter

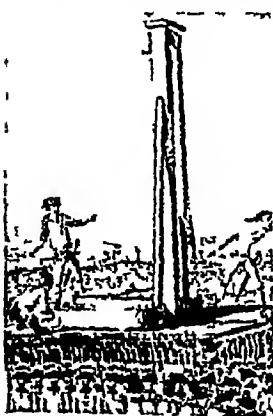
Most substances contract as they freeze, but you know from experience that this is not true of water. You have probably seen water jugs and pipes burst by the pressure of the water as it freezes. This also explains why ice floats. A cubic foot of water becomes 1.09 cubic feet of ice, and therefore as the little ice crystals form in the water they rise to the top and unite to make a solid surface of ice. Another interesting result of this tendency of water to expand as it freezes is that pressure will lower its freezing-point.

You can prove this by suspending a heavy weight by a wire loop passing round a block of ice. The wire will slowly cut all the way through the ice, but the block will remain perfectly solid as before. That is because the pressure of the wire gradually melts the ice, which again freezes as soon as the wire has gone through and the pressure has been removed. So, too, in skating the pressure of the skate blade on the ice melts a thin film of water which is very slippery. The same principle explains why glaciers can flow round corners.

## The FIGHT for LIBERTY in FRANCE

*Here we have the story of the most bitter of all revolutions—the battle for "liberty, equality, and fraternity" in France. Why did it begin? How did it end? This article answers those questions.*

**French Revolution.** "Liberty, Equality, Fraternity." These words are the motto of the French Republic, and were



The Guillotine Falls

the watchword of the French Revolution. Of the three, "Equality"—the abolition of privilege—was to the Frenchman of 1789 the most important. For it he was ready to sacrifice political "Liberty," as he did when, later, he accepted the yoke of Napoleon. For it "Fraternity," or brotherhood with all men, was allowed to remain a beautiful unfulfilled

dream. But "Equality" before the law was achieved then and has been retained ever since.

The Frenchman had a reason for his passionate devotion to equality. Before 1789 in equalities met one at every turn, and hampered

all progress. The nobles and clergy, the "privileged orders," were exempted from such direct taxes as the *taille*, and the chief burden fell upon the "Third Estate"—the peasants, artisans, merchants, professional men, etc. Even among these, taxes were not equal. Some provinces were exempt from certain taxes, as the *gabelle*, or salt tax. Then, too, the collection of certain taxes was done by contractors, or tax farmers, and the tax gatherer collected whatever he could. And woe to the man who seemed prosperous! As a result, the peasant lived in a hovel and concealed his resources, when he had meat to eat, he ate it in secret.

There were social and economic inequalities as well as political ones. The peasant groaned under the remnants of outgrown feudal dues, which were being collected with renewed vigour by the nobles in the latter part of the 18th century. The rabbits might destroy the peasant's garden, and the pigeons eat his grain, but he must not kill them, for they were protected for the lord's sport. His fences were broken down and his crops trampled in the chase, but he

## FRENCH REVOLUTION



### A 'MODERATE' WHO FAILED

The Comte de Mirabeau (1749-91) was elected President of the famous "Jacobin Club" and, just before he died, President of the National Assembly. From a rather dissolute youth he became a great orator and constitutionalist. But his efforts to bring Court circles to a sense of realities were in vain, and he was unable to prevent the Terror.

*Coudere Musée de Versailles photo Heurdein*

could claim no damages. On top of the dues to king and nobles came the dues to the Church. These and other obligations were often more irritating than burdensome, they were senseless and unreasonable to an age that was coming to believe, through the writings of Voltaire and others, in the rule of reason.

But were these conditions any worse in the latter part of the 18th century than they had been before? No, nor were they as bad in France as in some other parts of Europe, but now the people were beginning to think. The writers of the time—Montesquieu, Rousseau, Diderot and the other "Encyclopedists"—stirred up thought and discontent. (See France, Language and Literature.)

At last the day of reckoning came. The funds in the national treasury had been exhausted by the costly wars of Louis XIV, and by the extravagances of Louis and his successors. The £50,000,000 that the American Revolution cost France was the last straw. Turgot and Necker, as ministers of finance, had tried to save the state from bankruptcy by cutting down

the expenses of the court. But the court, led by the sprightly, frivolous and extravagant queen, Marie Antoinette, would not listen to the word "economy." These ministers were dismissed and more accommodating ones took their place. Loans were tried, but in the end the foreign bankers refused to lend more money. Public opinion was deeply stirred by the Parliament of Paris, a judicial body which defied the king and refused to levy new taxation.

In 1788 Louis XVI, as a last resort, called a meeting of the States General. This body represented the three estates—clergy, nobles and commons—of the French kingdom. It had no legislative functions, and could only make its influence felt by petitioning against grievances. First summoned in 1302 by Philip IV, it had not met since 1614, when Louis XIII dismissed it for criticizing the national finances. The representatives of the three estates came to Versailles, not far from Paris, early in May, 1789, armed with memorials (*cahiers*) demanding reforms. The grievances named differed, but all demanded a constitution.

With the meeting of the States General on May 5, 1789, the Revolution began. The representatives of the Third Estate led the way. Some of the nobles and many of the clergy joined with them. They changed the name of the gathering from "States General," which represented classes, to "National Assembly," which represented the people of France. When the king shut them out from their usual place of meeting, they adjourned to a neighbouring



### MOUTHPIECE OF THE REVOLUTION

Jean Paul Marat (1744-93) was the greatest journalist of the extreme party, and his violent articles stirred up the wildest passions. The Girondins brought him to trial before the Revolutionary Tribunal, but he turned the tables on his accusers. Marat was assassinated by Charlotte Corday.

*Bosc Musée Carnavalet Paris photo Bullo*



## THE ARISTOCRATS FACE THE MOB IN PARIS



This picture illustrates a scene which was often repeated in Paris during the days of the "Terror," when the revolutionaries, maddened by the threat of foreign invasion, vented their wrath on the members of the former ruling class. An aged member of the aristocracy, with his daughter on his arm, is being hoisted and jeered at by the populace.



## FRENCH REVOLUTION

tennis court, where they took the famous "Oath of the Tennis Court" (June 20, 1789), pledging themselves not to separate until they had given France a constitution. When the king sent a messenger to remove them from their hall, the fiery Mirabeau cried out "Go and tell your master we are here by the will of the people, and that we will be removed only at the point of the bayonet."

Paris, 14 miles away, was alarmed by rumours of the gathering troops about Versailles. A Paris mob stormed and captured the old state prison in Paris, the Bastille, on July 14. When the king in Versailles was informed of what had taken place, he exclaimed "Why, this is a revolt!" "No, sire," was the reply, "it is a revolution." The incident was trivial, but its significance was beyond words. To the present time, July 14, the date of the fall of the Bastille, is celebrated in France as the birthday of French liberty.

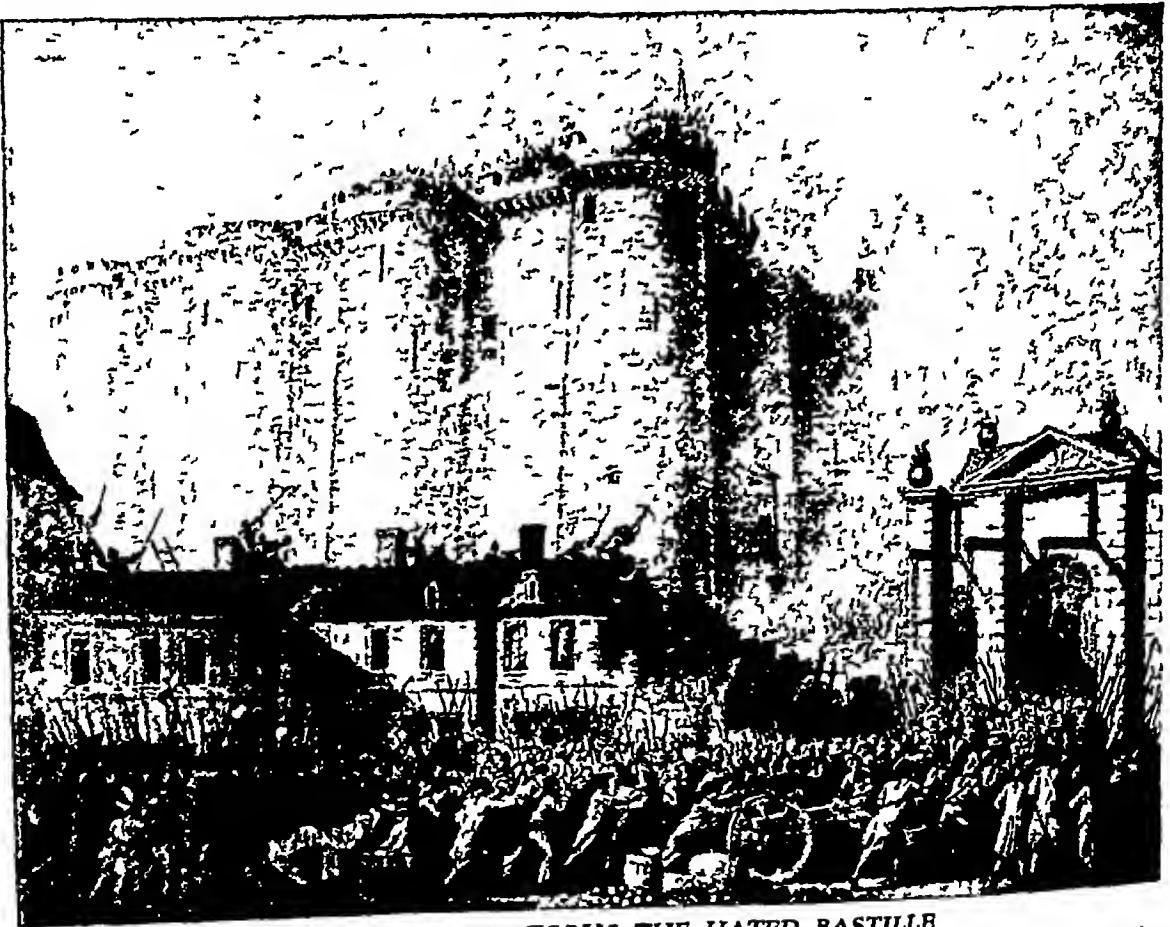
After the fall of the Bastille a revolutionary committee of middle class citizens governed Paris. A national guard composed mainly of citizens was organized and placed under the command of General Lafayette. Then the

provinces followed the lead of Paris and formed revolutionary governments.

A report of the peasant outbreaks made a wonderful impression on the Assembly. Some liberal nobles in that body set the example of renouncing their feudal rights. Amid the wildest enthusiasm, men weeping and embracing each other, one noble after another gave up some exclusive privilege, until finally a decree was passed which aimed at abolishing the entire feudal system. That wild night of August 4, 1789, saw the beginning of Equality, though remnants of feudal dues kept the peasants uneasy until 1793.

But what had become of the constitution which the Assembly had promised to France? Work on it progressed piecemeal, and it was completed in 1791. Nobility was abolished. France was made a limited monarchy, with a one-house legislature. The immortal part of the document was the "Declaration of the Rights of Man." It included these points:

- 1 All men were born free with equal rights
- 2 All citizens have the right to take part in electing representatives to make the laws

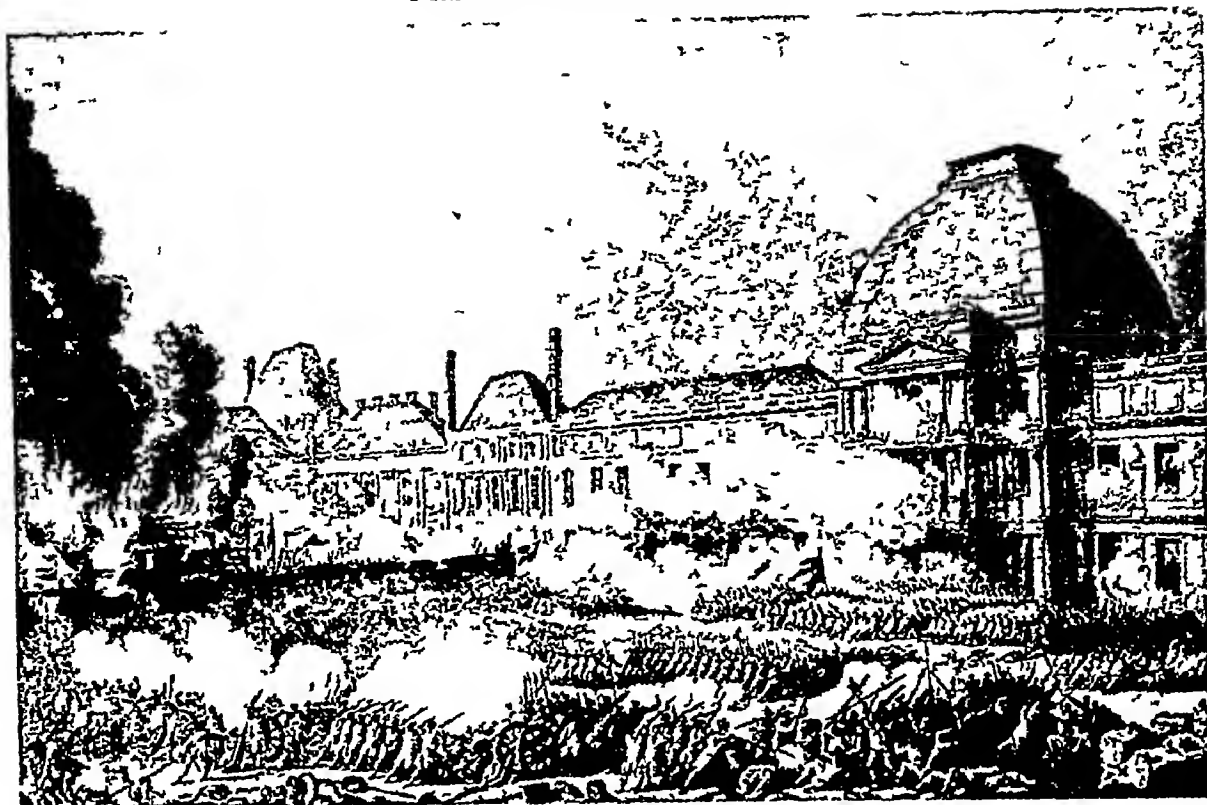


### THE PARIS MOB STORMS THE HATED BASTILLE

The fall of the Bastille on July 14, 1789, heralded the end of the old regime in France, with its blind despotism and repression of the people. The frenzied Paris mob, driven at last to action, stormed the feebly guarded prison-fortress without difficulty, and razed its massive pile to the ground. Here you see the chaotic scene in the smoke shrouded courtyard, as represented in a drawing by Prieur. The site of the Bastille is now marked by a bronze column.

The Louvre photo Giraudon

## FRENCH REVOLUTION



THE ATTACK ON THE ROYAL PALACE OF THE TUILERIES

In spite of its strong guard, the doors of this beautiful palace and residence of the King fell before the determined onslaught of its armed attackers on August 10, 1792. The crowd made their way into the royal apartments and confronted the King and Queen with their demands. On the intervention of Pétion, the popular mayor of Paris, however, they agreed to disperse.

*The Louvre drawing by Prieur*

3 Every person shall be free to speak, write or print his opinions provided he does not abuse this privilege.

4 The amount of taxes which a person is called upon to pay shall be based on the amount of wealth that he possesses.

The Declaration of the Rights of Man came to be regarded as the charter of democracy. The equality of all men in the eyes of the law is its essence. Property was inviolable, for the chief supporters of the new order held property or desired to hold it.

If the king had possessed the courage—the moral backbone—and the vision to put himself at the head of the movement, France might have been a monarchy today. But he was only a well-intentioned blunderer. At first he did promise to obey the constitution of 1791, which placed a narrow limit on his power. But then he listened to evil counsellors. Many nobles had fled before the storm. These *émigrés*, as they were called, later headed by his own brothers, were in Germany, Austria and Switzerland, appealing to the princes of Europe to stop the Revolution in France, and threatening a reign of bloodshed when they returned.

The people of France, apparently with good reason, mistrusted the king and still more Marie Antoinette, "the Austrian woman." In October 1789 a disorderly mob of women and men had brought them—and the Assembly

with them—from Versailles to Paris, that they might be more closely watched. The suspicions against them were changed into certainties for most of the people in June, 1791, when the king and queen with their children sought escape in flight. They were captured at Varennes, on the edge of the Argonne, just before they reached the border of France. From that day the monarchy was doomed.

These events hastened the division of the revolutionists into two parties, the constitutional royalists and the democratic republicans. In September 1791 the king ratified the constitution, and the new Legislative Assembly was strongly monarchical, but as the weakness of the government became more apparent, popular support shifted to the republicans.

### Proclamation of the Republic

On August 10, 1792, a mob invaded the Tuileries, killed the guards, and forced the royal family to seek refuge in the hall of the Legislative Assembly. On September 21, 1792, a decree was passed that "royalty is abolished in France," and a republic was proclaimed. Four months later Louis XVI was sent to the guillotine, the beheading machine used in the French Revolution.

The overthrow of the monarchy was not entirely due to the weakness of the king. Affairs generally in France seemed to be going from

## FRENCH REVOLUTION



### ROBESPIERRE SHOT AT THE MOMENT OF ARREST

Maximilien Robespierre (1758-94), arch-theorist of the Revolution, took the leading part in bringing Louis XVI to trial. This "sea-green incorruptible," as Carlyle called him, sent many of his former colleagues to the guillotine, but at last the members of the Convention, fearing for their lives, turned upon him. Here you see him being shot in the jaw by a young gendarme in the act of arresting him. Robespierre himself went to the guillotine, and the Terror came to an end soon after.

*British Museum*

bad to worse. The clergy and many devout Catholics had withdrawn their support from the Revolution because of the laws against the Church. First of all, the Church property had been taken by the State, this was a financial measure and generally approved. Then the "Civil Constitution of the Clergy" was drawn up, according to which all clergy from bishops to parish priests were to be elected, and all must take an oath to support the government. The lower clergy drew back, and only four bishops took the oath.

By a blunder the Assembly had divided the patriots, who had supported all changes up to this point. Others, especially merchants and tradesmen, were irritated by the paper money (*assignats*) with which the country was flooded, and which soon became worthless. Royalist uprisings were occurring in some provinces, as in the Vendée. While these dangers were threatening the Revolution within the country, Austria and Prussia, having finished the partition of Poland, were allied and hostile to the new order in France, which threatened the old order everywhere in Europe. England was

drawn into the war when the French revolutionary armies occupied the Austrian Netherlands (Belgium). It is a coincidence of history that Britain should twice again go to war for a like reason—when Germany violated Belgian soil in 1914 and invaded Poland in 1939.

To guide the Revolution through this crisis a strong government was needed, and for this reason the people of France sacrificed liberty. A "Convention" was called to draw up a new constitution, and for three years (1792-1795) a committee of this assembly, known as the Committee of Public Safety, ruled France with an iron hand, while the constitution remained safely shut up in a box. The power of this committee did not come from the Convention, but from the radical Jacobin Club, whose members in the Convention were known as the Mountain, from the high seats which they occupied in the hall of the Legislative Assembly.

The men of power were Danton, Marat, and Robespierre, until the second was struck down by Charlotte Corday. Through agents and spies and "deputies on mission" the great committee spread its net over the whole of the country.

By terror it maintained its power and position, and so this period of the Revolution is known as the Reign of Terror

By means of it, the royalist uprisings were sternly put down. Hundreds, even thousands, were sent to the guillotine. Marie Antoinette, Madame Roland, aristocrats and tradesmen, atheists like Hébert, finally even Danton himself (because he urged moderation), were executed, usually with no trial or only an imitation of one. Old institutions were changed. The worship of the Goddess of Reason supplanted religious services in the Paris churches. The calendar was reorganized, 1792 becoming the Year I, the first year of the French Republic, and the names of the months being changed.

#### Military Success Assured

But the Terror accomplished its purpose. The Prussian-Austrian invaders had been turned back at Valmy (September 20, 1792). Then the French armies carried the war into the lands of their enemies. "All governments are our enemies," cried an orator of the Convention, "all peoples are our friends." Belgium, Nice and Savoy were added to France. Under Carnot, fourteen armies were put in the field.

At length, however, the enemies of the Revolution at home and abroad seemed to be suppressed. Only Great Britain and Austria continued the war. The people were tired of the Terror, and when Robespierre showed no signs of stopping the bloodshed, the rest of the Convention took matters into their own hands. Robespierre was arrested and sent to the guillotine (July 27, 1794).

More moderate men now governed France. A young artillery officer, Napoleon Bonaparte, protected the new government. He was practically unknown at that time, but before long his history became the history of France. The new government, the Directory, proved unable to meet the problems within disorganized France. The glory of foreign victories which France won under it was due to Bonaparte. At length, November 9, 1799, he overthrew the Directory. Under the cloak of a *Consulate of three members*, he ruled France until 1804, when he threw off the cloak and became "Napoleon I, Emperor of the French." Liberty was gone.

Few events in history have so powerfully influenced the life of modern peoples as did the French Revolution, and on the whole that influence has been a permanent one for good.

**Freud, Sigmund** (Pron froid) (1856-1939). The father of psychoanalysis, was born at Freiburg in Moravia but he was educated at Vienna, which city was his home until he fled to England in 1938. He qualified as a doctor in 1882, and concentrated upon the psychological side of hysteria and kindred mental diseases. His book on hysteria published

in 1895, is said to mark the beginning of the science of psychoanalysis. His studies led him to assert that many forms of hysteria could be explained by the existence of an *unconscious mind* which influenced conscious behaviour. This unconscious mind, or suppressed ego, may be sometimes traced in dreams, to the interpretation of which Freud also devoted much attention.

From the first the revolutionary nature of Freud's theories, and the undue stress that they seemed to lay on sex impulses, aroused much antagonism. But there is no doubt that Freud, by applying his own methods, has achieved some wonderful cures with patients suffering from mental ailments, and the future alone will show whether these methods can be more widely applied for the benefit of mankind. He died in London on September 23, 1939.

**Friction.** Friction is the name we give to the resistance which one body meets in sliding or rolling over another. Friction is caused by the unevenness of surfaces which we find even among the hardest and best-polished objects if we examine them under the magnifying glass. The smoother the surface, the less the friction, hence in machines every effort is made to render the surfaces hard and smooth. Lubricants also lessen friction, and this is why engines, motor-cars and other machines are provided with elaborate oiling systems.

Furthermore, rolling friction is less than sliding friction. This is why bicycle and motor-car wheels are provided with ball bearings. Realization of this fact probably led to the invention of the wheel. Friction is also reduced by bearings made of "antifriction metals"—various soft alloys which are at the same time hard enough to hold their form against pressure. (See Alloys.)

#### A World Without Friction?

Because friction means resistance, never power, we sometimes regard it as a nuisance and dead loss. Yet a frictionless world would be a strange place. It is friction that enables us to transmit power by pulleys and stop trains by brakes. Without friction, tramcar and railway wheels would spin round without advancing, as they sometimes do when there is ice on the rails, and a thousand and one other forms of effort would be fruitless. The difficulty you experience when walking on ice arises from the fact that ice offers a minimum of resistance, in other words, there is insufficient friction for free movement. Friction in the wrong place, like sand in the bearings, is a dead loss, but in the physical world we should never get anywhere if we did not encounter resistance—friction—on the way.

**Frigate Bird.** The "man o'-war-bird," as the frigate bird is sometimes called, might be termed a feathered aeroplane. Without effort, it seems to glide along for hours at a time, ascending in spirals, or altering its course by so

## FRIGATE BIRD

slight a change in the angle of its "planes" that the movement is not apparent

The larger (*Fregata aquila*) of the two species occurs in the tropics of both hemispheres, mainly north of the Equator. The other species, *F. minor*, appears in the Indian Ocean.

Frigate birds have long, stout, hooked bills, the tail is extremely long and deeply forked, and the bones are so formed as to make this bird lighter than any other bird of equal wing size. When spread, the long narrow wings measure 10 feet from tip to tip. But frigate



THE FRIGATE BIRD'S WEIRD COURTSHIP

At courtship time few birds look so queer as the male frigate birds. These creatures have a curious crimson sac on the throat, which they inflate to a great size, and which appears to exercise a great attraction for members of the opposite sex. On the wing, frigate birds are magnificent, having a wide wing-span and exceedingly beautiful flight.

birds have very small legs and are almost helpless on land.

Perhaps the most striking characteristic is the air sac of the male, which lies along the throat and, when fully distended, reaches outward to the end of the long bill and downward so as to obscure the breast, it then looks like a great red balloon. When deflated the sac is invisible beneath the plumage of the neck. This sac is used during courtship. The feathers are deep brown, the female birds, however, have light under feathers.

These birds nest mainly in colonies on tropical islands, building in trees, low bushes or on the ground. The nest contains a single white egg. The birds feed on fish, which they steal from gulls and other birds, their closest relatives are probably the pelicans.

## FROEBEL

**Frobisher, Sir Martin** (c 1535-1594) Where is the boy who will not be thrilled at the famous description of this romantic sea rover—"He was a man whose highest ideal was courage, tempered by piracy"?

What would not you have given to have been Drake's vice admiral, to have been knighted for your valour on your own ship by the great Queen Elizabeth herself following the defeat of the Spanish Armada, to have served that intrepid admiral, Sir John Hawkins, on the Spanish Main, to have ventured into uncharted Arctic Seas to find the North-West Passage?

Such a man was Sir Martin Frobisher, the sailor hailing from Yorkshire, and already, at nineteen years of age, voyaging to Guinea and the Levant and North Africa, whose shores were then the haunt of the infamous Barbary pirates. In 1575 he set out in the tiny vessels Gabriel and Michael to seek the North West Passage, reaching Greenland, and finally anchoring in Frobisher Bay in Baffin Land, lat 63° N, at the entrance to the Davis Straits. This spot is the beginning of the long sought North West Passage that was to baffle explorers for nearly four centuries until Amundsen (qv) in 1905 achieved its navigation.

In 1577 and in 1578 Frobisher, as Admiral of the Cathay (China) Company, made similar voyages, enduring all the hardship of Arctic exploration in those days of small, ill-provisioned ships.

Then from 1586 till 1594 this gallant sailor was busy fighting the Spaniards off the coasts of Spain and in the Channel, commanding the well-named *Triumph*, ship of the line, and materially contributing to the immortal triumphs of Drake and Hawkins. But in the brilliant attack on Brest he was mortally wounded, he was brought to Plymouth, and here died on November 22, 1594.

**Froebel, Friedrich Wilhelm** (Pron fiê-bel) (1782-1852) Froebel, the great German educator, was over 50 years old before he found his real life work, the kindergarten, and yet the various occupations of his youth and manhood were, in a sense, a necessary preparation for it. An unhappy boyhood turned his thoughts early to lonely, neglected children. The years which he spent at his



uncle's house as apprentice to a forester must have filled his heart early with the love of Nature which colours all his thinking Surveying, clerking, architecture, university study helped him to understand all kinds of people

Born April 21, 1782, in his early twenties Froebel was engaged as a teacher at a school at Frankfort which was conducted on the principles of Pestalozzi, the famous Swiss educational reformer He realized immediately that he loved the work, but in spite of his success he spent several years studying in close



**SIR MARTIN FROBISHER**

This great explorer was a rough fellow and a hard master, and he certainly looks it in this old picture Like most Elizabethan seamen, he was something of a pirate, too, and relieved the Spanish King of plenty of gold from the Americas.  
Bodleian Library Oxford

intimacy with Pestalozzi and also at several German universities

In 1816 he established his first school It was not until 1837, however, that he founded the sort of school that has had so wide an influence on education all over the world That was the kindergarten—"children's garden" in English—a school for children between the ages of four and six The great idea which he developed in his books and in his schools was that

children must not be taught by rule, but according to their natural instincts and activities Play was the basis of his teaching

But Froebel did not live to see his idea fully accepted The Prussian government abolished kindergartens in 1851, because the authorities considered them socialistic Froebel died the next year (June 21), considering his life a failure But, as is often the case with men of new ideas, the teaching which he had thought out lived on (See Kindergarten)

**Frog.** Frogs, like toads and newts, belong to the class of backboneed animals known as *Amphibia*, which means that they are prepared to live both in water and on land They all have a moist, clammy skin without scales, all lay their eggs in water, in jelly-like masses, and all pass through a tadpole stage

A story about one of the American species is given in pages 1765 to 1768, but here we may follow the life of the common British frog (*Rana temporaria*) as an example of frogs in general

First, we must look for the eggs in water a foot or less in depth, in the oozy quiet places at the edges of ponds and small lakes Here, in the spring, both males and females gather for the annual egg laying We may locate them by their low croaks Usually in the night or early morning the female lays her yearly batch of eggs, enclosed in a single mass of jelly which is attached to a pond plant of some kind

A small frog may lay 2,000 to 3,000 eggs, a large one 6,000 to 8,000 Each egg is perfectly spherical in shape, black above, light below, and about one sixteenth of an inch in diameter, and is surrounded by jelly When first laid, the whole mass is as large as a teacup, but it gradually swells up with water and increases in size several times by the time the eggs hatch

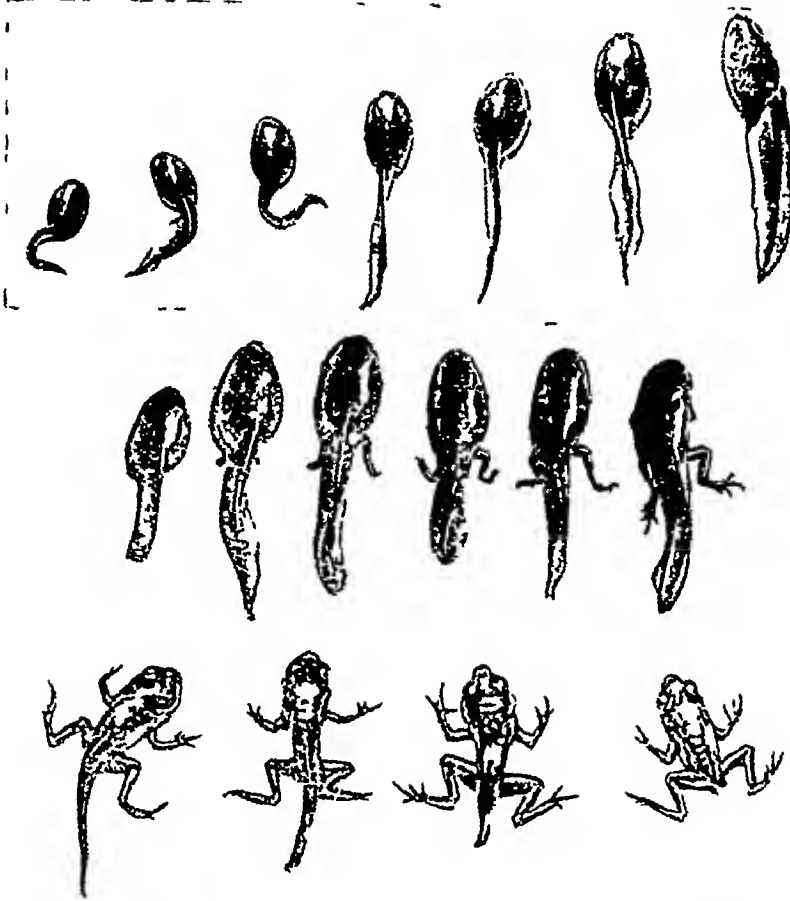


**F W FROEBEL**

All children who have been to kindergartens should be grateful to Froebel, for he it was who invented them and turned school work into play



## FROG



near the water. He absorbs water through his skin and stores it in his bladder, to keep his body moist. When the autumn frosts come he buries himself in oozy places to hibernate, or pass his long winter sleep. In the spring Mrs. Frog lays her eggs in the water again.

The frog feeds and grows through his first summer, then passes his first winter asleep. The second summer he feeds and grows again, and sleeps again the next winter. He comes out the next spring for the first egg laying, but he is not really full grown till he is about five years or more old. After that how long does he live? No one knows very accurately, but a good many years—perhaps 10 or 20 or 40, if he is lucky enough to escape from freezing and drought, and from his many enemies.

From the beginning of his life to its end the frog is a

### TADPOLE INTO FROG

The gradual change from a tadpole to a baby frog is well illustrated above. First the head of the tadpole swells considerably and then the legs appear. The tail is still attached but this is soon absorbed. On the right is the adult frog.

*Photos J. I. Roberts & S. Johnson*

It is hard to believe that so large a mass was laid by a single mother frog.

Let us follow one of the eggs. It hatches out into a short, stumpy tadpole. A few days later it has grown gills for breathing, a tail for swimming, and a pair of horny plates, with which it nips off bits of pond vegetation and gobbles up great amounts of mud for the small quantity of food contained in it. The tadpole has really many fish-like characteristics.

So it lives and grows till it is a strong, full-grown tadpole, more than an inch long—in eight weeks or less if the weather is warm, more if the weather is cool. Then the tadpole begins to snuff air into his small lungs. As he snuffs more air his lungs grow larger, while his gills get smaller and disappear. Also his long, powerful tail gets shorter till it is all absorbed, meanwhile, his legs have grown for his land life.

Many other changes take place in the tadpole, inside and out, during his wonderful change into a frog, and by the time he has lost his tail he seems actually smaller than he was as a tadpole.

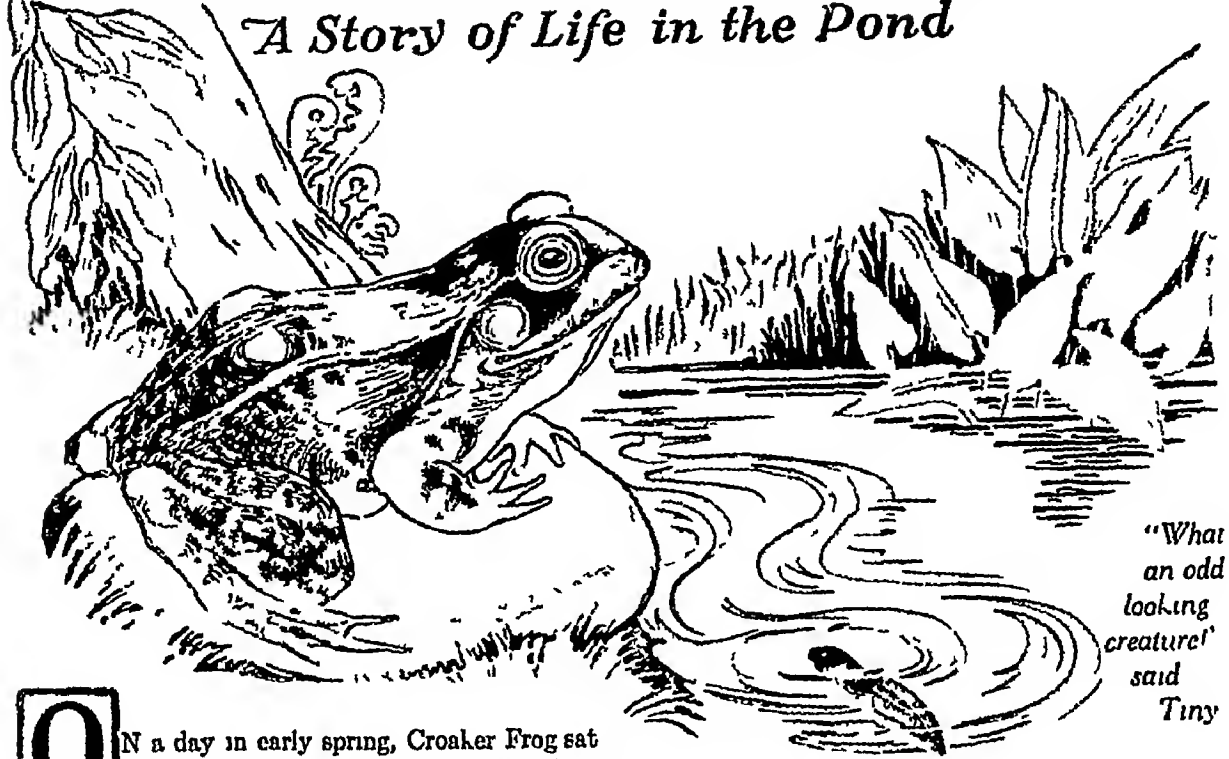
For the rest of his life the frog lives chiefly among vegetation in marshy places, but always



wonderfully fascinating creature, and likewise a very useful one, for he captures and gets rid of thousands of mosquitoes and other insects of many kinds that pester man and animals. Also he is good to eat, frog's legs being regarded as a delicacy among epicures. Many thousands of frogs are used yearly in medical and biological laboratories in all parts of the world for all sorts of experiments.

# The TADPOLE who WANTED to be a FROG

## A Story of Life in the Pond



"What  
an odd  
looking  
creature!"  
said  
Tiny

**O**N a day in early spring, Croaker Frog sat under the drooping branches of a willow tree near the edge of Shady Stream. He was a fine looking young frog, with his coat of green and his white vest. On this spring morning he felt very happy, as he sat there enjoying the feel of the warm air and the sound of the wind in the trees.

All through the long cold days of winter he had slept in the mud at the bottom of Shady Stream. When the first warm wind came down over the hills, and the snow and ice began to melt, he had awakened. He was very glad that spring had come, and very glad indeed to be hopping about once more.

This morning he had hopped up and down the bank of Shady Stream for quite a while. By and by he grew tired, so he sat down on a large flat stone under the willow tree and closed his eyes.

He had not been sitting there long when three little black tadpoles came swimming by. Seeing Croaker Frog, they stopped to look at him.

"Dear me!" said Tiny, the smallest tadpole. "What an odd looking creature! I wonder what it is."

The two other little tadpoles stared at Croaker Frog for a moment. "I don't know," said the second little tadpole. "I don't know at all."

"I don't either," said the third little tadpole.

"Just look how his throat trembles whenever he breathes!" said Tiny Tadpole. "And just look at his long hind legs! What can he ever do with legs like that, I wonder?"

Just then Croaker Frog opened his big round eyes so suddenly that two of the little tadpoles were frightened and swam away as fast as they could. But Tiny Tadpole was not frightened. He stayed right where he was and said politely, "Good day, sir! Would you mind telling me who you are?"

Croaker Frog looked down at the little tadpole in the water, and croaked, in his deep voice, "I'm Croaker Frog, and I live here in Shady Stream."

"You do!" Tiny Tadpole said in surprise. "Why, I live here, too, but I never saw you before."

"Have you lived here long?" Croaker Frog asked.

"No, I haven't," Tiny Tadpole answered. "I haven't lived *anywhere* very long, because I'm only a few weeks old."

"Well, I have lived here a long time," Croaker Frog said. "I'm sure I've seen you before. Aren't you a tadpole?"

"Yes," Tiny Tadpole answered, "that's what I am. Now, I would like to ask you a question."

"What is it?" said Croaker Frog. "I will answer it if I can."

"I would like to know what you do with your long hind legs," Tiny Tadpole said. "I never saw legs like those in all my life."

"I use them to swim with, and I use them to hop with," Croaker Frog told him. "I can hop very far and very fast," he added proudly.

# FROG

by he drew himself together  
and gave a mighty leap!



"Can you, indeed?" said Tiny Tadpole "Let's see you do it!"

Croaker Frog hopped along the bank and back again so fast that it almost took the little tadpole's breath away "Oh!" he said "I wish I could do that. What else can you do?"

"Well, for one thing," Croaker Frog said, "I can sing, because I am a male frog. Female frogs can't sing. I often sit here in the evening and sing with the other frogs."

"And what else can you do?" Tiny Tadpole asked eagerly.

"I can catch flies and gnats with my tongue," said Croaker Frog, swelling out his sides proudly. "Look!"

He shot out his long notched tongue and caught a fly which was buzzing by.

"Did you see that?" he asked proudly. "Did you see my tongue shoot out? Did you notice that it is hinged at the front end, so that I can make it go over such a long way?"

"Indeed, I did," answered Tiny Tadpole. "I wish I could do that. The only thing I do is swim."

"I can swim too," Croaker Frog replied, "and I

can dive from that high bank away out into the water."

"I never heard of anyone who could do so many things!" exclaimed Tiny Tadpole. "But I don't understand about diving. How do you do it?"

"I can't tell you very well," said Croaker Frog, "but I can show you. Would you like to see me dive?"

"Of course I would," said Tiny Tadpole. "I want to find out how it is done."

Croaker Frog hopped up the steep bank. When he had reached the top he sat for a moment, high above Shady Stream. Tiny Tadpole watched him closely.

Suddenly Croaker Frog drew himself together and gave a mighty leap!

Out through the air he went, his long hind legs spread far apart! Tiny Tadpole, looking up at him as he passed high overhead, gave a little wiggle of excitement. "Dear me!" he said. "That's almost like flying!"

Splash! Croaker Frog landed in the middle of Shady Stream, sending up a great spray of water all around him. He made such large waves that the little tadpole was almost washed out on the bank.

"Goodness gracious me!" said Tiny Tadpole. "That was the most wonderful thing I ever saw!"

"It was a fine dive, wasn't it?" said Old Turtle, who came swimming lazily along. "Young Croaker Frog is a splendid jumper."

## FROG

"I do wish I could jump like that," Tiny Tadpole said

"Do you?" Old Turtle asked blinking his eyes slowly

"Yes, I do," Tiny Tadpole answered "I wish I could jump the way Croaker Frog does I wish I could hop about on the bank I wish I could catch flies with my tongue I wish I could sing I'm just a little tadpole I can't do anything but swim "

"Well, now, I wouldn't feel too bad about it if I were you," Old Turtle said kindly "Maybe some day you will do all these things too "

"What do you mean, Old Turtle?" Tiny Tadpole asked eagerly "Do you really think I will be able to?"

"I shouldn't wonder," said the turtle "I'll tell you what, suppose you come with me for a little swim I think I can show you something that will surprise you very much "

"Let's go right away!" cried Tiny Tadpole

"All right," answered Old Turtle "Come along!"

They swam slowly away, down—down—down, to the very bottom of Shady Stream Old Turtle stopped beside the roots of some water weeds

"Look around you, young Tadpole," he said, "tell me what you see "

"I don't see anything," said Tiny Tadpole, "except a lot of little tadpoles "

"Do you see anything queer about them?" Old Turtle asked

Tiny Tadpole looked at them closely "Why, they haven't any eyes or any mouths, have they, Old Turtle?"

"No," answered Old Turtle, "they haven't "

"But how do they eat?" Tiny Tadpole asked in surprise

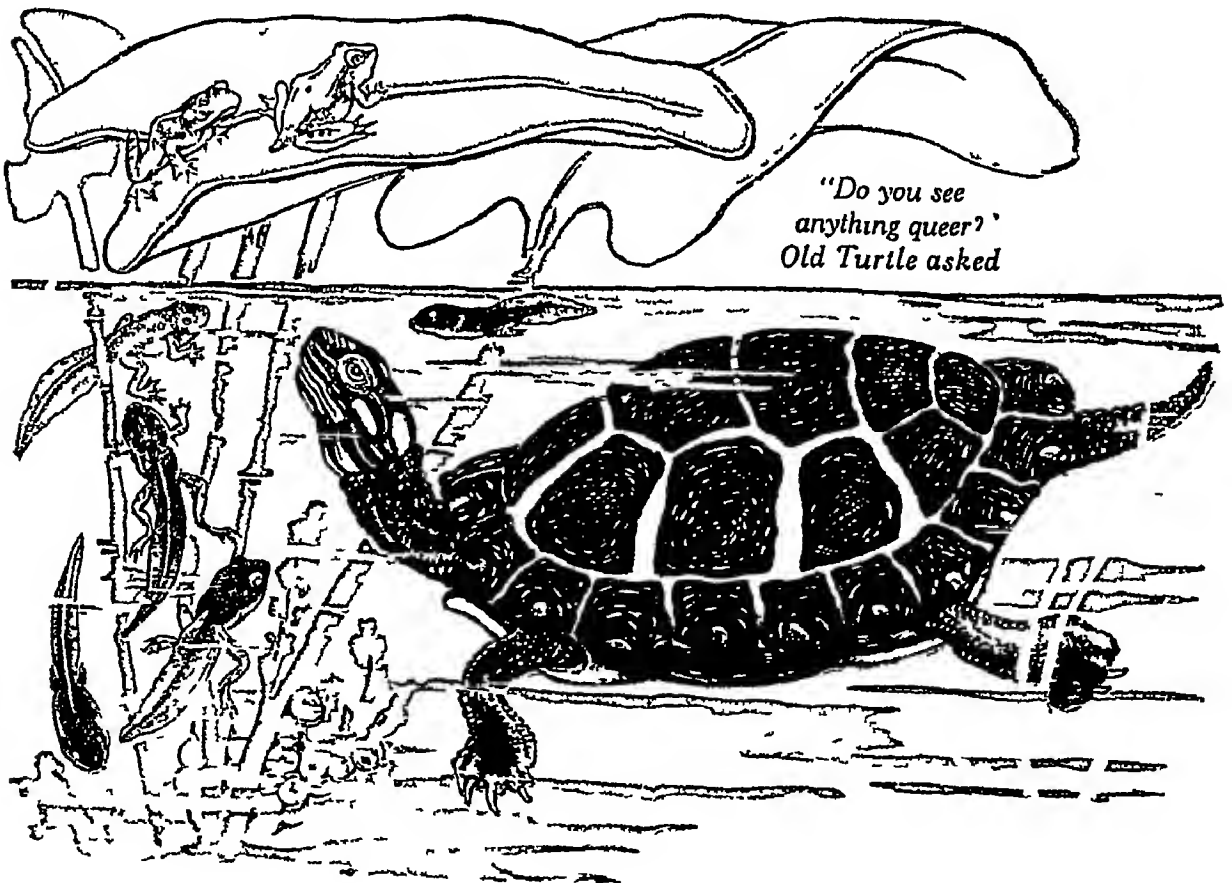
"They don't eat They aren't hungry, so they don't eat They just lie here at the bottom of Shady Stream and wait But in a day or two their eyes and mouths will grow—just as yours did "

"What! Didn't I have any eyes or mouth at first?" Tiny Tadpole asked

"No, you had no eyes and no mouth You came out of an egg, you know, just as all little tadpoles do, and at first you didn't do anything You lay here on the bottom of Shady Stream and just waited, like these little fellows "

"Did I?" asked Tiny Tadpole "I've forgotten all about it Isn't that strange!"

"Yes, it is," said Old Turtle, "but something even stranger than that is going to happen to you soon, young Tadpole "



"What is it? What is it?" Tiny Tadpole said, wiggling his little tail very fast. "Please tell me quick, Old Turtle!"

"I will show you what is going to happen to you if you will come with me," answered the turtle, and he swam away.

Tiny Tadpole swam after him as fast as he could, and presently the turtle stopped again.

"Now tell me what you see," he said.

Tiny Tadpole looked around him. There, among the water weeds, were the oddest little creatures he had ever seen. He stared at them for a moment without speaking. "Why," he said at last, "you are tadpoles, aren't you?"

"I suppose we are," one of the odd little creatures answered. "At least we were tadpoles only a few days ago. But see what is happening to us now! It is something very strange, something we don't understand at all. Look at us closely. See! Each one of us is growing a pair of hind legs!"

"So you are!" cried Tiny Tadpole. "Why are you doing that?"

"I'm sure I don't know," the little creature said slowly. "Do you know, Old Turtle?"

"Yes," said Old Turtle, "I know why you are growing hind legs, you are turning into frogs, that's why. Pretty soon your front legs will grow too, and then you will lose your tails."

"Lose our tails!" cried the little creature. "Won't it hurt?"

"Not a bit," said Old Turtle. "They will just get a little shorter and a little shorter each day, and then you will be frogs and can hop and dive and swim."

"Oh!" cried Tiny Tadpole. "How wonderful! I wish I could be a frog."

"You will, because you are a tadpole," Old Turtle said. "One of these days, you, too, will lose your tail and your legs will grow. Then you will be just like Croaker Frog."

"Will I?" asked Tiny Tadpole eagerly. "And will I be able to hop very far and very fast?"

"Yes," Old Turtle told him.

"And will I be able to dive?"

"Yes, you will do that too."

Tiny Tadpole swam very close to Old Turtle. "And will I be able to sing?" he asked anxiously.

"Yes," Old Turtle said, "of course you will."

"Oh! Oh! Oh!" Tiny Tadpole wiggled all of his little body. "Do little tadpoles always turn into frogs? Do they, Turtle?"

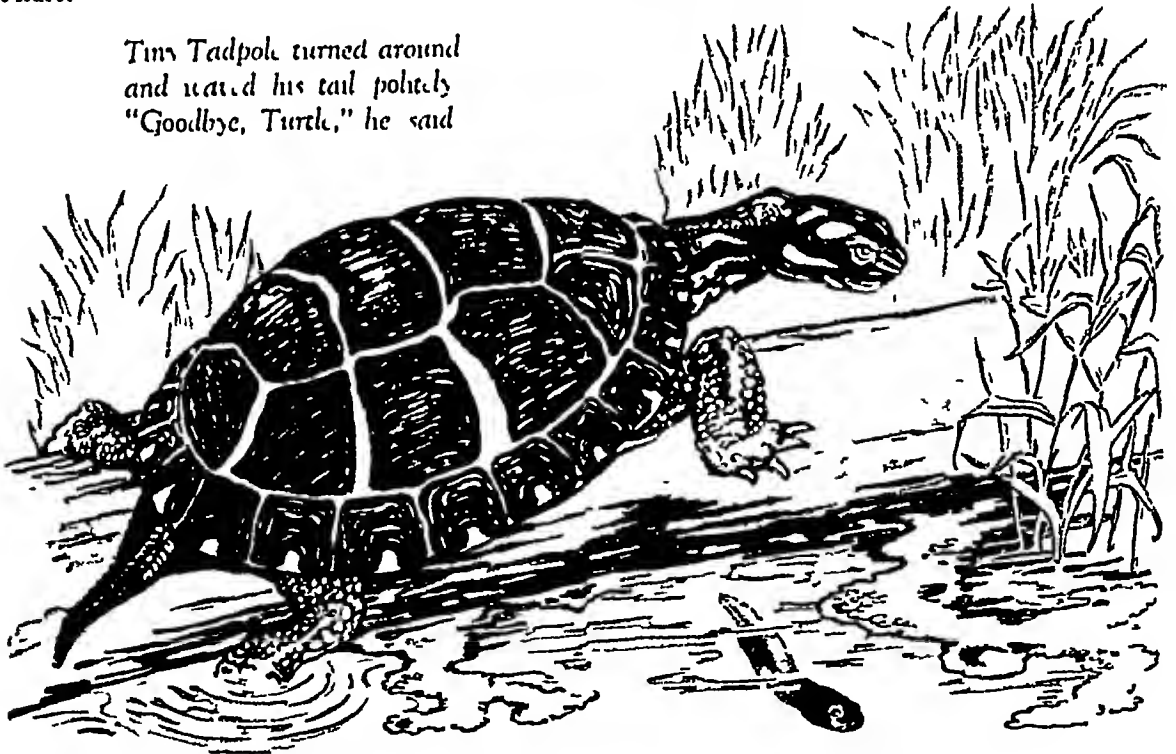
"Yes," Old Turtle answered.

"Well, that is the very most wonderful thing I ever heard," Tiny Tadpole said. "I am going right now to tell all the other little tadpoles."

Tiny Tadpole turned around and waved his tail politely. "Goodbye, Turtle, and thank you very much for telling me," he said.

"Goodbye," said Old Turtle, and swimming to the bank of Slady Stream he climbed out on a log and went sound asleep.

Tiny Tadpole turned around  
and waved his tail politely.  
"Goodbye, Turtle," he said.



## FROISSART

**Froissart, JEAN** (Pron frwah sar) (1337-1410?) This French chronicler lived at a time when all the world was indeed a stage, when the curtain rose on great castles and tall cathedrals, when armoured knights on strong war horses trod the earth, and chivalry and poetry were in the air. Froissart gloried in the stirring life of his age, in its gorgeous colouring and heroic deeds. He sang of it in verse, and he wrote a history, his famous "Chronicles," which gives us our most vivid account of the superstitious, romantic, warring world of that time.

Froissart's "Chronicles," in four books, trace the history of the main events in England, Scotland, France and

Flanders between the years 1326 and 1400, and form one of the greatest of medieval historical works. The first book, which owes much to the earlier chronicler Jean le Bel, takes the English point of view, having been written under English patronage. But on the whole Froissart gives a fair version of events as he saw them, or as the witnesses available described them to him. He spared no effort in the search for reliable testimony, talking with lords and knights, squires and heralds, and jotting down from their lips tales of the court and the battle field. Modern research has corrected errors of chronology, statistics and topography, but

though in his own day his praises were largely unsung, Froissart shows a great advance on most of his predecessors. He definitely presents his picture as a whole, relating cause and effect in due sequence, and is not content to enumerate bald facts. But his work is chiefly prized for its lively narrative of the best side of the age of chivalry, and for its accounts of Crécy, Poitiers and other battles of the French war.

The son of an heraldic painter, Froissart was born at Valenciennes. To collect the stories he tells us, he travelled to many lands. He became secretary to Philippa of Hainault, queen of Edward III of England, in 1361, and while in her service visited the court of King David II

of Scotland. For a short time he returned to his native Flanders, but in 1366 followed Edward the Black Prince to Gascony, and visited several courts of North Italy. Philippa died in 1369, and he found other patrons in Duke Wenceslas of Brabant and Gui de Blois, the overlord of Chimay, to whom he became chaplain and from whom he received a canonry of Chimay. Previously he had been given the benefice of Lestine au-Mont. In 1385 he travelled with a knight named Espaing de Lyon, whose stories gave him much picturesque matter for his "Chronicles," to the brilliant court of Gaston Phoebus of Foix at Orthez. Leaving Gaston, he went to Valenciennes to



**ONE OF FROISSART'S MANY LIVELY SCENES**

This illustration beautifully illuminated comes from a manuscript of Froissart's "Chronicles" in the British Museum. It shows John Ball, the revolutionary priest, addressing the Kentish rebels of the Peasants' Revolt in 1381—with whom you may be sure the aristocratic Froissart had very little sympathy. On the left you see Wat Tyler, leader of the rebellion.

start the fourth book of his "Chronicles." Having spent some time gathering further information, he found a new patron in Count Robert of Namur, to whom he dedicated the "Chronicles." After paying a last visit to England, still on the quest of details for his history, he returned to France to find the French knights preparing for the Crusade which ended so disastrously at Nicopolis. From 1400, when the "Chronicles" stop, his life is obscure.

Often his stories contradict one another, and there is no doubt that his imagination filled in the barren spots where facts were wanting. His sympathies are always with the lordly knights rather than the humble townsmen and



peasants But his "Chronicles" are faithful to the spirit and pageantry of those days, even though he was sometimes mistaken on facts

Perhaps the most remarkable story of the many that Froissart relates is that of the Bourg d'Espagne, about whom he was told on his journey to Spain

"Ah, sir," quoth I, "is the Bourg d'Espagne so big a man as ye speak of?"

"Yes, sir, truly," quoth he, "for in all Gaseony there is none like him in strength of body, therefore the Earl of Foix hath him ever in his company It passed not a three year that he did in a sport a great deed



"So it was, on a Christmas Day the Earl of Foix held a great feast and a plentiful of knights and squires, as is his usage, and it was a cold day, and the earl dined in the hall, and with him great company of lords And after dinner he departed out of the hall and went up unto a gallery of four-and-twenty steps of height, in which gallery there was a great chimney wherein they made fire when the earl was there, and at that time there was but a small fire, for the earl loved no great fire, howbeit, he had wood enough thereabout, and in Béarn is wood enough The same day it was a great frost and very cold, and when the earl was in the gallery and saw the fire so little, he said to the knights and squires, 'Sirs, this is but a small fire, and the day so cold'

"Then the Bourg d'Espagne went down the stairs, and beneath in the court he saw a great many asses, laden with wood to serve the house Then he went and took one of the greatest asses, with all the wood, and laid him on his back, and went up all the stairs into the gallery, and did cast down the ass with all the wood into the chimney, and the ass's feet upward, whereof

the Earl of Foix had great joy, and so had all they that were there, and had marvel of his strength, how he alone came up all the stairs with the ass and the wood on his neck"

Under Wat Tyler, Jack Straw, and John Ball 60,000 peasants marched to London in 1381 to get their wrongs righted In this manner Froissart relates Richard II's stern measures

"The King entered into Kent, and came to a village called Ospringe, and called the mayor and all the men of the town before him, and when they were all come into a fair place, the King made to be showed them by one of his council how they had erred

"And because that the King knew well that this business was begun by some of them, and not by all, wherefore it were better that some did bear the blame than all, he commanded that they should show who were culpable

"In like manner as the King did at Ospringe he did in other places in Kent and in all other places of his realm where any rebellion had been, and there were hanged and beheaded more than fifteen hundred"

**Frost.** The frost you know best is the 'white' frost, that clothes the lawn and the trees and all the garden with a white mantling This is a "hoar frost"—really water crystals, essentially like snow and ice When the air is



#### PATTERNS OF FROST

Such beautiful "feathers" as those above are caused by moisture running down a window, freezing as it goes. The upper picture shows hoar frost outlining lupin leaves.

Photos G. A. Clarke



#### FLOWERS THAT THE FROST HAS MADE

Ice and snow crystals take many beautiful forms, though most of them are only seen under a powerful magnifying glass. Ice, however, produces one curious formation on a larger scale, when the freezing and re thawing of water produces frost crystals to which the name of ice-flowers is given. The photograph shows ice flowers on the lake at St. Moritz, Switzerland.

ready to form dew, that is, when it is calm and saturated with moisture or water vapour, then, if the temperature falls below freezing-point, frost or crystallized water is formed instead of dew or liquid water. If the air in a room is dry, frost will not form on the window panes, no matter how cold it is, but boil a kettle of water in the room or bring a number of people in to fill the air with moisture laden breath, and at once frost patterns will form on the glass, provided the temperature remains low. Stillness of the air is also essential.

#### Explaining the 'Black' Frost

Sometimes the air is too dry or too windy for hoar frost, but the temperature falls below 32° F. This is what is known as "black frost," sometimes called "rime," though it might more properly be called a "freeze." Black frost is much colder than white. Plants freeze in the night time and turn black when the sun melts the sap in the morning.

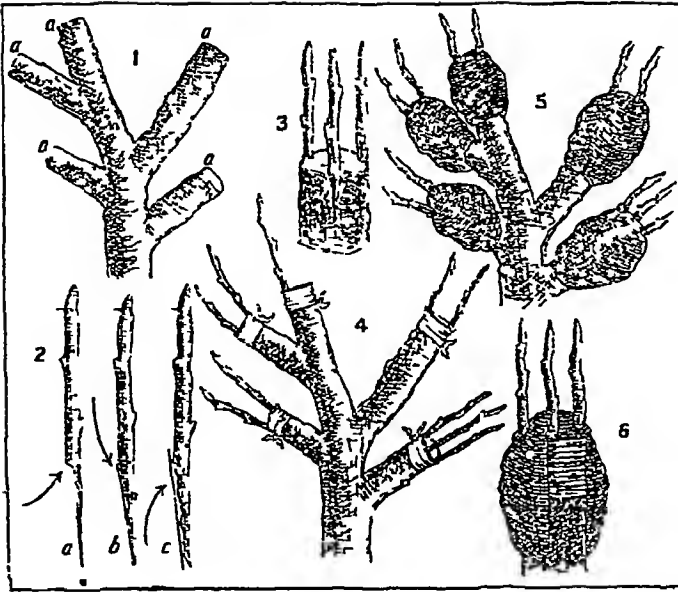
Frosts are matters of particular concern to farmers, because early autumn frosts may kill crops before harvests, and late spring frosts often kill planted crops and fruit buds or seriously retard their growth. Often it is not the actual cold that kills, but the sudden expansion when the sun warms the vegetation

in the morning. That is why fruit farmers put a light cloth canopy over their trees to prevent the early morning sun reaching them. At night, too, a canopy over plants prevents radiation of their heat into the air, and reflects back the heat from the soil. A fire which produces an abundance of smoke is useful.

#### Why Frosts in the Valley?

It is a matter of common knowledge that crops on hill sides often escape frost, while crops in the adjacent valley are destroyed. This is not caused, however, by cold air "flowing down hill" into the valley, as commonly supposed. All the air cools and becomes denser and heavier after nightfall. The air in the valley, since it is already as low as it can get, remains in position and becomes colder and colder. The air on the hill-sides falls a little because of its weight, and then "slides out" over the surface of the bottom air, as though over the surface of a lake, and warmer air from above settles into its place. Thus the temperatures on the hill sides are kept higher than in the valley.

**Fruit and Fruit Growing** Although primitive Man undoubtedly ate wild fruits of all sorts, he did not enjoy the wonderful variety of choice flavours and splendid colours that we have today, for these are largely the outcome



### GRAFTING FRUIT TREES

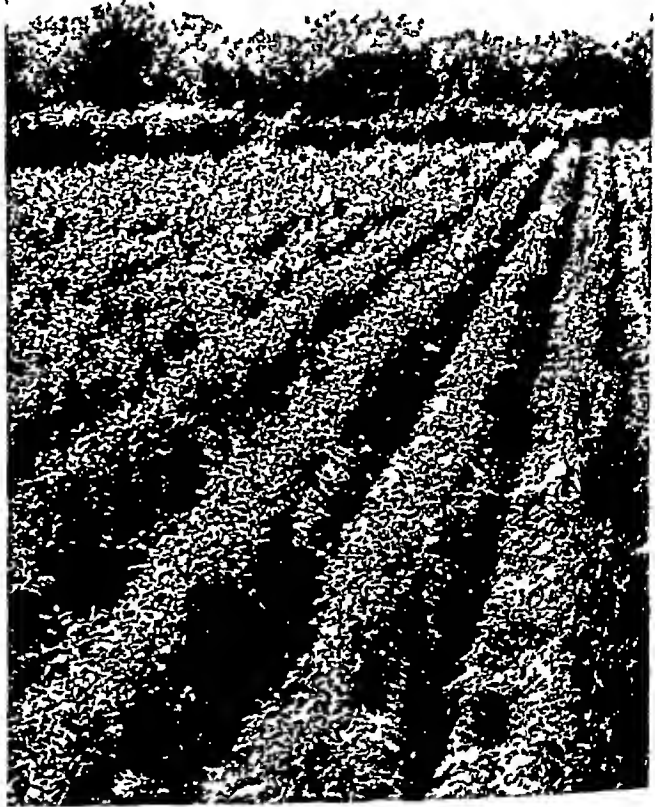
Cultivated apples are obtained by grafting shoots, or scions, from existing trees on to "stocks." The photograph (right) shows a field of stocks. The diagram above shows one method of grafting. 1, Tree preparation at (a). 2, Scions (a), correct, (b) and (c), badly prepared. 3, How scions are inserted. 4, Scions bound in position. 5, Final binding with grafting wax. 6, Section showing raffia binding under wax.

of human skill and industry exercised through many years.

Highly-developed fruits with tempting flavours, seedless, thin skinned, and over-sized fruit, and fruit stalks without spines or thorns—these are some of the marvellous changes due to Man's experiments in fruit growing. Such results have been obtained in some cases by cross-fertilization between two species, so that the desirable qualities of both are combined in one hybrid but in general they have come about only after many years' work by experts.

However, the seeds of hybrids and other choice varieties obtained by careful selection and cultivation will not usually run "true to type." Trees and shrubs grown from such seeds tend to go back to the form and habits of their wild ancestors. To overcome this difficulty, the process of grafting is used, by which a bud or twig of the choice variety of tree or shrub is made to grow from the roots or stem of a common or even a wild member of the same tribe. The bud or twig, called the "scion," is inserted in a cleft cut in the "stock plant," and the joint is then dressed and bandaged to protect it from the air. If this "plant surgery" is properly performed, the two will grow as one tree, which will bear fruit of the same quality as the scion's parent

Great changes in the fruit industry have come about by improvements in packing, and by refrigeration and rapid means of transport. Formerly apples were practically the only fresh fruit enjoyed in winter. Perishable fruit could be eaten fresh only in season and in the locality where grown. Now fruits of all kinds are regularly shipped from one country to another, and many kinds are kept in cold storage warehouses for winter use. Many fruits are brought to England—melons from southern France, peaches grown in the hothouses of Belgium, plums, oranges, apricots and other fruits from South Africa, and citrus fruits of all kinds from Mesopotamia. Those delicious, exotic fruits of the Orient, the mango



and the mangosteen, which long resisted all efforts to preserve them, are now delicacies easily obtained. Apples, lemons, bananas, and oranges are regularly supplied throughout the year, while pears, grapes, and peaches, which a half-century ago were enjoyed only for a few weeks, are now on the market for many months. During the boyhood days of men now in middle age, bananas were a

## FRUIT

curiosity to be had only in large cities. They are now displayed in every fruiterer's all the year round. Even more remarkable is the grape fruit, twenty years ago it was unknown here—today it is on every breakfast table.

There are many other tropical fruits, however, which are little known—such fruits as the *pawpaw* of the tropics, a fruit resembling a small cantaloup, the *tamarind*, which has long brown-shelled pods containing a brown acid pulp, used in making cooling drinks and marketed in sweet preserves, the *loquat*, a Chinese or Japanese fruit resembling a yellow plum, the *cashew apple*, on the fine flavoured fleshy stalk of which is borne the nut of the tree, *guava*, represented by the two varieties, red and white, one shaped like an apple and the other like a pear, the pleasantly acid pulp of which is made into guava jelly, *mangosteen*, a reddish-brown fruit about the size of an apple and having white juicy pulp of delicate sweet yet acid flavour, *cherimoyer*, or custard-apple, the small heart-shaped pulpy fruit of a little tree grown in Colombia or Peru, and the *star apple*, a West Indian fruit like an apple in size and appearance, with a star-shaped centre formed by the seed cells.

In the chief fruit-growing countries thousands of workers are employed in the large orchards in picking, sorting or grading, packing, and marketing the fruit. The workers must know their trade and work with nimble fingers. The fruit, picked just at the right time, which is before it is ripe, is carefully handled, wrapped, and closely packed to prevent bruising, which might cause the fruit to rot before reaching the market. In most of the fruit areas the grading, shipping, and marketing, even the advertising, is carried on by effective co-operative organizations. They strictly supervise the quality so that the reputation may be maintained, and so enable them to market the product at the best rates for the producer.

The United States is the leading fruit-growing nation both for quantity and variety of fruits grown, and the crop in some years is worth in the neighbourhood of £100,000,000. Apples are the most important fruit crop and the most widely distributed, having been developed in a thousand varieties, most of them well adapted to growth in northern latitudes. Vast quantities

of apples come to us from Canada, Australia, New Zealand, and Tasmania, while the Canary Islands and the West Indies supply us liberally with the popular banana.

The fruit-grower chooses well-drained land for the orchard site, with good subsoil to the depth reached by the tree roots. The young trees, grown in a nursery, are set out in regular spaced rows in the orchard when they are one or two years old. The orchard is cultivated to keep out weeds; sometimes cover crops such as clover or alfalfa are grown and then turned under to add nourishment to the soil, while sheep and pigs may be folded under the trees of a large orchard for their manurial value. When pigs are allowed the run of an orchard



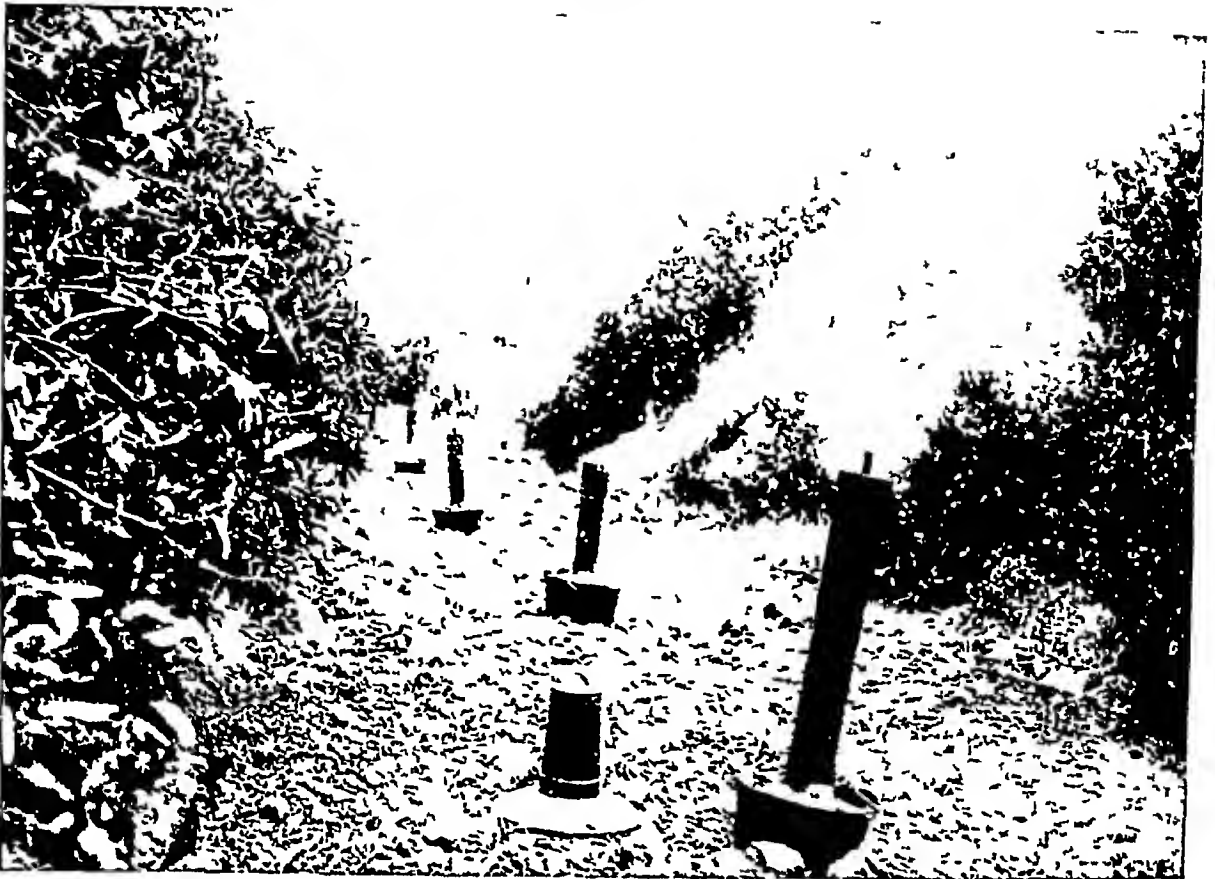
APPLES IN A FRUIT 'HOSPITAL'

For

Strictly speaking, you cannot 'cure' an apple which is diseased. You can only try to prevent the disease from occurring again. Here you see the laboratory at Covent Garden Market, to which fruiterers bring any abnormal fruit they find. It is very necessary that the fruit we eat should be carefully examined by these chemists, especially when it is imported from overseas.

they should be prevented from rubbing themselves against the young bark of the trees.

Another important operation in orchard and vineyard is that of spraying to prevent injury to the tree or its fruit from insect or fungus pests. Some sprays—contact sprays—kill the insects by closing their breathing apparatus, while others, used against insects that chew or bite the leaves, poison them. These are usually arsenic solutions of one sort or another. Dusts or powders are also used, sometimes even being distributed on large orchards from aeroplanes. In general, power spraying machines are now used in large orchards, and hand sprayers in gardens and small orchards. It is important that the material, whether liquid spray or dust, be applied very finely and evenly, to prevent



SMOKING 'JACK FROST' OUT OF A CALIFORNIAN ORANGE GROVE

Even in the warm climates where oranges grow, the nights sometimes are cold and Jack Frost is liable to do a good deal of damage if precautions are not taken. Accordingly, little stove like affairs like these, containing oil, coal, coke, or wood, are set throughout the orchard, and while the heat warms the atmosphere the smoke helps to form a protecting blanket.

injury to the leaves of the plant, and over as much surface as possible. The fungicides may also be either dusted or sprayed upon infected plants. They destroy the delicate tissues of the fungus growth without injury to the "host."

Pruning is also very necessary to good fruit production. By a proper cutting back of wood growth, fruit bearing wood may be given increased vigour and the tree opened up so that the sunshine will reach the fruit. Pruning away dead branches prevents injury to the tree through spread of the decay, removes a natural harbour for insects and other enemies of trees, and gets rid of weight that would uselessly encumber the tree. Even old neglected orchards may be restored to bearing fruit by proper pruning and careful cultivation.

Frost coming after the trees have begun to bud can do enormous damage to the orchard. When warning of an untimely frost is given out on the wireless, the fruit-growers of any region act promptly to protect and save their precious trees. Special fires forming a blanket of smoke overhead to prevent the loss of heat through evaporation during the night, curtains of vapour formed over the orchard by spraying water high into the air, and a system of hot-water pipes running all up and down the rows of

trees are methods used to keep the temperature well above the freezing-point. (See Frost)

Fresh fruits, like green vegetables, contain much water, and are not therefore substantial foods. Their great value lies in their aid to the digestion of other foods and in the desirable mineral salts, fruity acids and vitamins which they contain. Dried, preserved, and tinned fruits hold an important place in our diet. (See Canning Industry)

Fruits in the botanical sense are the parts of the plant which contain the seeds. To the botanist, the seed-carrying portions of all plants are fruit, even if we do not commonly think of them as such, so that we may name three main fruit classifications: (1) fleshy fruits, such as berries, oranges, melons, tomatoes, and apples, with seeds in the flesh; (2) stone or drupaceous fruits, which contain stones, such as plums, peaches, and cherries; (3) dry fruits, including nuts and grains, legumes, such as beans and peas, and capsules, pods, or similar containers, such as the seed-vessels of flowers.

In the fleshy fruits, the whole seed envelope, or *pericarp*, is fleshy or juicy. In the drupes, the part of the fruit round the seed (the *endocarp*) becomes hard or stony, forming the peach or plum or cherry stone, while the outer portion



(the *exocarp*) is fleshy Dry fruits may be divided into "splitting" fruits, like peas, beans, and poppy capsules, which break open and scatter the seeds, and "non-splitting" fruits, like acorns, grains, and nuts

**Fry, ELIZABETH (1780-1845)** Today what Elizabeth Fry did is done as a matter of course, what she advocated has been wholly adopted, but it is not too much to say that, but for her personality and persistence, the twin problems of prison reform and relief of the destitute would have been left untouched for many years to come throughout Europe

Elizabeth Fry was the daughter of a Quaker banker, John Gurney, and was born May 20, 1780, near Norwich At the age of 20 she married Joseph Fry, a London merchant, and also a Quaker Already she had begun what was to be her life-work, visiting the sick and relieving distress, and she had gained her first impression of prison conditions when, as a child of 13, she visited the Norwich house of correction At the age of 29 she first took part in a public Quaker service, and before long she became a "minister," devoting her life to good works

In 1813 she paid her first visit to Newgate prison She was warned that it was hardly safe

to go, that the prisoners were vicious and dangerous What she saw made her wonder not that the inmates were so savage, but that they were not insane as well At once she embarked on schemes of practical and spiritual relief She supplied clothes and other necessities, and in 1817 formed the Association for the Improvement of Female Prisoners, which was devoted to the establishment of what we now look upon as the first principles of prison discipline—classification of criminals, separation of the sexes, female supervision for female prisoners, and provision for religious and other instruction and for useful employment Largely through her efforts these principles were widely adopted She corresponded with various authorities on the Continent, visited Ireland in 1827, France in 1838, and Germany and Holland Her reforming activities included the hospitals and the nursing system, as well as the administration of lunatic asylums

She died at Ramsgate, October 12, 1845

**Fuchsia.** (Pron fū'sha) Fuchsias had a romantic introduction to England Many years ago a London nurseryman saw one of these plants in a sailor's dwelling in the dock district "What a beautiful plant!" he exclaimed "Where did you get it?"



**ELIZABETH FRY PAYS A VISIT TO NEWGATE PRISON**

The 19th century saw a great amelioration in social conditions in Great Britain, and among the ardent advocates of reform was Elizabeth Fry Prison reform and the relief of the destitute were the aims to which she devoted herself with untiring energy and devotion and she laid the seeds of those reforms which have led to the humane conditions that exist today In the course of her work she visited many prisons, in this painting she is seen reading the Bible to the prisoners in Newgate.

From the painting by George Barratt





## POPULAR KINDS OF FUCHSIA

One of the favourite garden plants is the fuchsia whose red and purple blossoms you see above. Those on the left are single the right-hand ones being of the double type.

The sailor's wife smiled as she looked at the flower that had come from far off Chile. "My husband brought it from foreign parts," she answered proudly.

The nurseryman, recognizing it as one of the same rare plants that had been brought from South America that very year (1788) and placed in Kew Gardens, promptly bought it and procured from its cuttings several hundred plants which he sold for a high price. From these and from other specimens brought principally from Central America, Peru, and Chile have been evolved the many plants whose brilliant, drooping, funnel-shaped blossoms of purple and rose and white make so gay a show in many of our old-fashioned gardens.

The nectar of the flowers contains an unusually large percentage of cane sugar, and the little four-celled berries are sometimes sweet and good to eat. From certain species a dye is obtained. All the fuchsias belong to the evening primrose family (*Onagraceæ*). The plant was named after the botanist Leonhard Fuchs.

**Fuel.** All industrial and mechanical progress depends on energy, and all energy ultimately depends upon fuel. It gives us all our steam-power and most of our electric power. It drives ships, engines, machinery, and mechanical transport. Virtually every ounce of metal we use is extracted from the earth's minerals with the aid of fuels. Look round you and try to find a manufactured article that is not, in one way or another, a product of fire. There are a few—a hand-carved piece of wood or ivory, for example—but they are not important. Cloth, leather, glass, paper,

rubber, celluloid, cement, brick, paint, ink, glue, are all heat treated in the course of their production.

The similarity of the common fuels to food is much closer than we might realize at first thought. Both contain carbon compounds. (See Carbon). When we "burn" these carbohydrates of our food inside our bodies, with the aid of the oxygen we take into our lungs from the air, we get the heat energy that supplies power to our muscles and nerves. In the same way all the ordinary fuels we burn in our stoves, power plants, engines, and chemical processes, release their stored up energy by oxidation of their carbon ingredients. (See Energy, Fire, Power, Respiration).

Primitive Man burned wood to heat his cave, to cook his food, and to frighten off wild animals. At his simple hearth he learned to fashion crude tools and weapons. And he found he could use animal and vegetable oils and fats for light and sometimes for heat. The first step towards the development of a better fuel was probably the discovery that charcoal (*q v*) gave a more intense heat and less smoke than wood.

These things happened so long ago that we cannot give them any definite date. But we do



## CUTTING PEAT FOR FUEL

In many districts of Ireland and in parts of Wales and Cornwall the main fuel is not coal but peat, which is a kind of turf made of moss and forming deposits many feet deep in boggy places. Here you see peat being cut in the Bog of Allen, and, behind, stacks of the drying fuel.

## FUEL

know that coal was used by Greck blacksmiths some three centuries before Christ. The development of the great oil industry of today began about the middle of the 19th century. The use of gas dates back little more than a century.

Fuels may be divided into solids, liquids, and gases. Of the solid fuels, coal is by far the most important. Almost three fourths of the power the world uses today is produced by coal.

Coke, which is left after the extraction of coal-gas and coal tar products from coal, is much used in homes and factories because it gives intense heat without smoke. Peat burns slowly, is smoky, and has a low heat value. Wood has greatly diminished in importance as a fuel. Its heat value is small and it is very expensive. Charcoal, once considered indispensable for reducing metal ores, has now been largely replaced by coke. Other solid fuels are paraffin wax and tallow, usually burned in the form of candles. Chief among liquid fuels are the products of petroleum—petrol, paraffin, and various forms of partly refined crude oil or residue called "fuel oils."

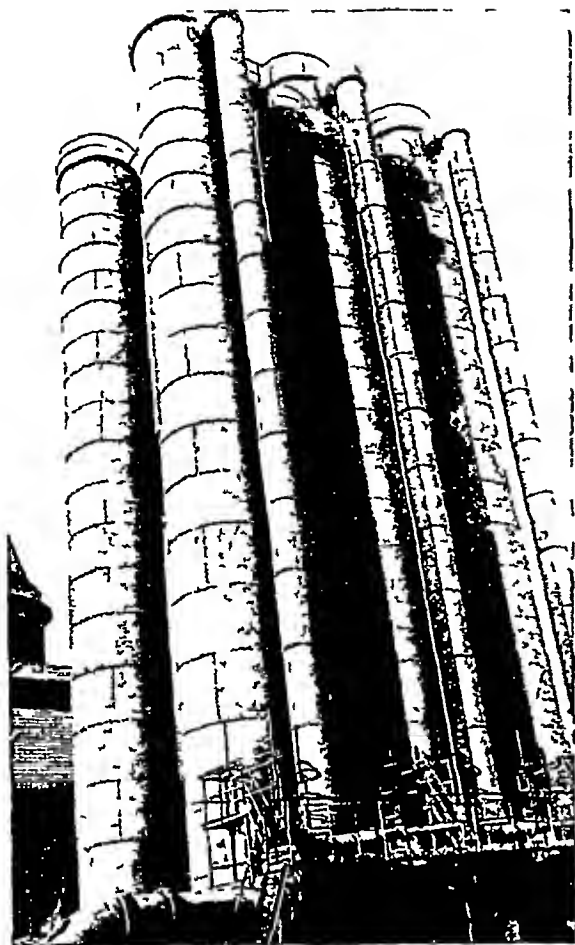
Fuel oils are burned extensively in specially constructed heating plants in homes and other



NATURE'S OWN GAS-WORKS

Topical

In the Canadian province of Alberta there are vast quantities of natural wet gas that form a valuable source of power. The gas, which is accompanied by much naphtha, is tapped by pipes, and when it reaches the surface is separated and stored. The smaller photograph shows a separator. It is covered with frost because the wet gas comes to the surface at the astonishingly low temperature of 22 degrees below zero. Surplus gas is burned for safety's sake and the lower photograph shows the huge flames. The well illustrated produces 20 million cubic feet of gas daily.



#### BENZOLE PLANT IN GERMANY

This section of a huge German power plant shows the great containers of benzole, or benzene (not to be confused with the familiar 'benzine'), produced by the distillation of coal tar. From benzole we get aniline, the source of many wonderful dyes.

buildings, but their greatest use is in firing locomotives and steamships. They are easy to store and handle, they can be piped directly into the fire-box, and their fuel value, in proportion to the space they occupy, is about twice that of coal. Paraffin, the chief illuminating fuel, is still largely used.

Animal and vegetable oils, formerly used as illuminants, no longer have much importance among the world's fuels. Alcohol, an excellent fuel and one of the cheapest to manufacture, has never been extensively burned because the restrictions and taxations imposed upon it as a beverage have limited its production and kept its price relatively high. It is employed to a limited extent in small heaters for light cooking and laboratory work.

With the invention of the petrol engine came the widespread use of fuel as a direct source of power, in contrast to the indirect method of first transforming fuel energy into steam and then using the steam pressure to drive the engine. Of course, the principle of the "internal combustion engine," according to which a

substance is burned inside a cylinder to get power from the resulting gas pressure, had already been used in firearms, but gunpowder and other explosives are not ordinarily classed as fuels, nor have the many attempts to design motors driven by them been commercially successful. It was the petrol engine that introduced a new era in the history of fuels, raising petrol to a place of prime importance. And now its close relative, the Diesel engine, is rapidly demonstrating the value of the heavier and cheaper fuel oils in this field.

#### Gases as Fuels

Of the many gases that can be burned, coal gas and natural gas are by far the most important commercially. (See Gas Industry.) Coal-gas can, of course, be made more uniform in quality than natural gas, and its heat value is generally higher. Both enjoy the advantage over coal that they produce neither smoke nor ashes, and they can be turned on and off or regulated instantly. Minor fuel gases include acetylene, used in miners' lamps, buoys, and oxy-acetylene torches, and gases that are by products of industrial processes, such as producer gas and blast-furnace gas. The latter are mostly used where they are generated.

The development of nations has been greatly affected by the possession or lack of fuel. Britain, for example, owed the rise of her industrial power as much, perhaps, to her very abundant coal deposits as to the genius and spirit of her inventors. An interesting incident in the history of fuel was the rise of the rich whaling industry of New England in the 18th and early 19th centuries—an industry dependent largely on the use of spermaceti and whale oil for making candles and for burning lamps. With the advent of paraffin, the industry virtually disappeared.

What is the future of fuels? The question is often raised about what the world will do when its natural supplies are exhausted. But it is doubtful if even our remote descendants will have any cause to worry. Alcohol, if necessity arises, can always be manufactured in virtually unlimited quantities, and scientists know already how to produce many synthetic fuels which would be available now if the supply of cheaper natural fuels were cut off.

The thermal or heating value of fuels is measured in calories or in British thermal units.

**Fulton, Robert (1765-1815)** The inventor. Fulton was born on a little Pennsylvania farm on November 14, 1765. At 17 he went to Philadelphia to work for a jeweller and study art. So well did he use his time and talents that at 21 he had £80 to invest in a farm for his mother and sisters before going to London to study art with Benjamin West. But English friends encouraged Fulton to turn engineer, and

## FULTON

art was soon forgotten in the midst of a series of useful inventions of dredging machines, flax spinning and rope making devices, and a substitute for canal locks.

It was not surprising that the American from the land of rivers, canals, and great distances turned his mind to the steamboat. Fulton's first experiments were with a torpedo firing submarine in the harbour of Brest. But though Napoleon's chief problem was how to combat the English Navy, his engineers were not interested in Fulton's submarine or in his first steamboat experiments on the Seine. Robert Livingstone, the American Minister, however, took him up. He had already been promoter of a company to run steam boats on the Hudson. Fulton returned to America as a partner of Livingstone.

The scoffers might call his boat "Fulton's Folly," but he knew it would work—and it did. On August 17, 1807, the *Clermont*, with her English built engine, made her trial trip from New York to Albany—150 miles upstream—in about 30 hours. The craft won immediate favour.

In 1815 Fulton built for the United States the first steam warship. He was never wealthy, and lawsuits about patents and overwork undermined his health. He died in New York, February 24, 1815.

**Fungi.** (Pron fung' gi) A large group of very simple plants, distinguished by the fact that they do not contain the green colouring matter (chlorophyll) possessed by higher plants, are known as fungi.

This group includes all moulds, mildews, rusts, smuts, bacteria, truffles, puff-

## FUNGI

balls, toadstools, and mushrooms. Being without the chlorophyll with which to manufacture their food out of raw materials, the fungi are compelled to live upon the food produced by other plants and animals. When they get their food from living creatures, fungi are called "parasites", when they live on dead animal or vegetable matter, they are called "saprophytes". Parasitic fungi do a vast amount of harm in the world, causing diseases in men, animals, and plants. The saprophytes, on the other hand, do a great deal of good as scavengers.

Fungi range in size from the tiniest moulds to the huge toadstools. Many varieties such as the



**ROBERT FULTON 'TRIES OUT' HIS SUBMARINE**  
The American engineer, Robert Fulton, was in some respects far in advance of his time. He succeeded in building a practicable steamboat, and he conceived the idea of a torpedo firing submarine, in which he tried to interest Napoleon, but without success. Fulton actually constructed such a vessel, and carried out experiments with it in Brest harbour.



#### FOUR TYPES OF FUNGUS THAT GROW ON GROUND AND TREE

In these four photographs you see typical examples of the great group of the fungi. At the top, left, is the 'candle-snuff' fungus, a black-and-white species of unusual form, about two inches high. Next to it is an oyster fungus, a species that grows on decaying trees. On the left, below, is the 'lawyer's wig,' one of the commonest species, another name for it is 'shaggy caps', it is a scavenger, living on rotting vegetable matter. Finally, on the right, is the curious earth star.

Photos S. T. Waters, A. S. Martin, T. I. Breck

lichens are eaten by wild animals. Some, like mushrooms and truffles, are highly prized delicacies for human food. Certain others are used for making drugs and dyes. Yeasts are among the most useful of all fungi.

Fungi are divided into four groups: *Bacteria*, *Phycomycetes*, such as black mould, downy mildews, *Ascomycetes*, such as mildews, truffles, cup fungi, yeasts, *Basidiomycetes*, or rusts, smuts, mushrooms, toadstools, and puff-balls.

**Furnace.** The most familiar type of furnace is that which heats the air or water or generates the steam by which public buildings and offices are warmed. (See Heating and Ventilation) But there are also various types of furnace used in manufactures. These may be classified as furnaces in which the fire and the material to be heated are brought into contact—as in the blacksmith's forge, the blast furnace, and the cupola, furnaces in which the



## AN ASSEMBLY OF THE MUSHROOMS



Painting by Marshall Smith

The artist has assembled here twelve of the most important members of the mushroom tribe, including one deadly species. They may be identified by reference to the key plate on the next page.



## AN ASSEMBLY OF THE MUSHROOMS



KEY TO PRECEDING COLOUR PLATE

SUCH an assembly is possible only in a printed page, for we may be sure that nowhere can we find growing in one spot all the mushrooms shown on the preceding plate

But this coming to gether at the magic summons of the painter's brush is a great convenience for purposes of comparison. We can identify the various species through the small key picture at the left.

From top to bottom we see the Shaggy Pholota, *Pholota squarrosa* (1) Puff Ball, *Lycoperdon bovista* (2), Dog Mushroom *Cortinarius caninus* (3), Coral Clavaria, *Clavaria coralloides* (4), Red Clav

aria, *Clavaria rufescens* (5), Violet Clavaria, *Clavaria amethystina* (6), Meadow Mushroom, *Agaricus campestris* (7) Parchment Lactarius, *Lactarius pergamenus* (8), Deadly Amanita or Fly Mushroom, *Amanita muscaria* (9), Common Morel, *Morchella esculenta* (10), Magpie Mushroom, *Coprinus picaceus* (11), and Yellow Chanterelle, *Cantharellus cibarius* (12)

With the exception of the Amanita, all these are edible, though the Coral Clavaria and the Parchment Lactarius are sometimes slightly poisonous when immature or stale. The best rule to follow with mushrooms, however, is never to attempt to select edible varieties from pictures or verbal descriptions alone. Always get the advice of real experts and ask them to point out to you the actual growing specimens that are safe.

Many so called tests for distinguishing poisonous species have found their way into popular tradition and popular literature. None of them is a safe guide, as many people have tragically discovered.

## FURNACE

fuel is in one compartment and the substance to be heated in another—as in the reverberatory furnace used in making iron and steel, and furnaces in which the material to be heated is in a closed chamber or sealed retort heated by external flames, hot gases, or electricity—as in pot furnaces for making glass and crucible furnaces for making steel.

Perhaps the most interesting type is the modern electric furnace, out of whose furious blasting heat have come some of the most amazing achievements of modern chemistry. With the aid of its tremendous temperatures—7,000° Fahrenheit and more, double that of the hottest furnace fed with ordinary fuel—we can melt platinum, chromium, tungsten, molybdenum, and other refractory metals from their ores.

We can also fuse quartz, and blow it like glass to make flasks and retorts, and we can take carbon in one form, ordinary coal, and turn it into another form, graphite. Carbon and silicon are fused into one of the hardest substances known, carborundum, so much used for grinding and polishing metal. Carbon and lime are forced to unite to make calcium carbide, which we use to make acetylene gas. Phosphorus is literally burnt out of phosphate rocks,

## FURNITURE

to be used in making matches. Most of the alloy steels used in modern manufacturing are made in the electric furnace, and the electric furnace is being used more and more instead of the other processes in the production of steel.

Most wonderful, perhaps, of all the miracles of the electric furnace is the fixation of atmospheric nitrogen. Enormous furnaces in which electric arcs are drawn out into great disks or spirals of flame are used to force the nitrogen and oxygen of the air to combine, forming nitric oxide, which is easily turned into nitric acid or nitrates for fertilizers and explosives.

### Types of Electric Furnace

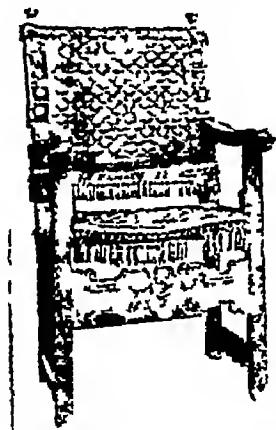
There are several types of electric furnace, but they all consist essentially of a crucible of some non-conducting heat-resisting material. In the arc type, a powerful current is passed between electrodes or from electrodes to the substance being treated, causing fiercely hot electric arcs. In another type the crucible is surrounded by wires or rods which are heated by the passage of current. Chrome nickel can be used for the current up to temperatures of 1,000° C. For higher temperatures, molybdenum or platinum is required, usually in an atmosphere of hydrogen, to avoid oxidation.

## HOW *we* GOT *our* TABLES *and* CHAIRS

*In this article we are told two stories of furniture—the history of tables and chairs from earliest times, and the explanation of how these useful objects are made in modern days.*

**Furniture.** At one time the making of furniture distinguished for beauty and grace, as well as merely for utility, was a handicraft

which bore the stamp of the individual, whether he was a great designer or a mere copyist. To day, the invention of modern machinery has made it a factory process, in which fine individual workmanship is too often lacking. However, it is still possible to obtain fine pieces in the most modern manner, designed by artists or, more often, architects



An Early 17th Century Chair

of international repute, and executed as single pieces never to be repeated.

In ancient times and throughout the Middle Ages houses were very scantily furnished. Chairs were reserved for the lord of the house and favoured guests, otherwise stools and benches, chests for clothing, beds, and tables—which were often just boards laid across trestles

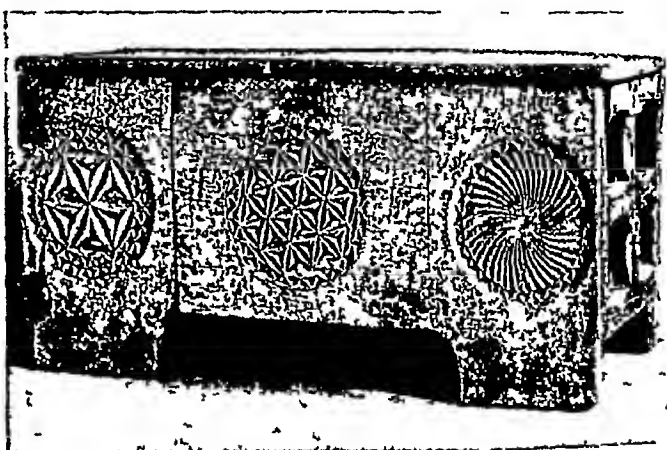
—formed the greater part of the furniture. Egypt, Greece, Rome, and other ancient nations had elaborate pieces of furniture made of ivory, bronze, silver, and gold, and decorated with precious stones, but these were rare and belonged only to the great.

### A Chair Three Thousand Years Old

The early Egyptians were adept in wood working, and pictures on their tombs and some pieces that have been preserved indicate that they had wooden furniture, sometimes carved and gilded and covered with splendid textiles. Five specimens were found in Tutankhamen's tomb, and there is in the British Museum a wooden throne of an Egyptian queen who lived 3,000 or more years ago. It shows considerable artistry and skilled handwork.

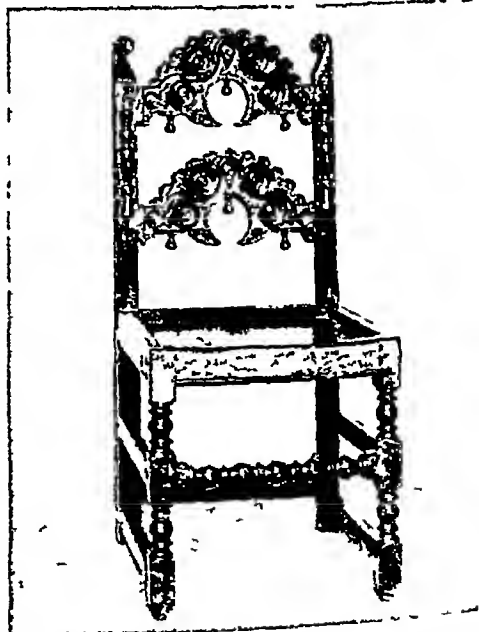
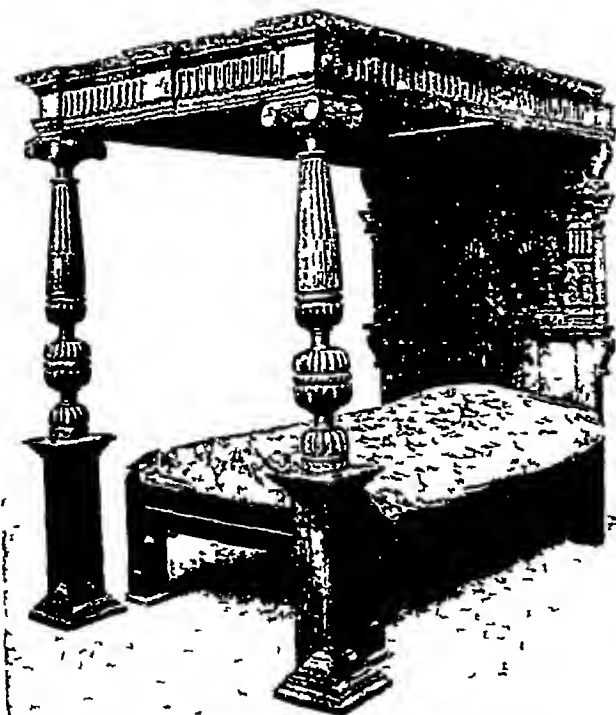
The period of the Renaissance marks an important development in furniture making. Florence, Milan, Rome, and Venice became important centres of cabinet making, and the idea of furnishing the home as a place of comfort and beauty was for the first time given serious consideration. But all the time, in England and elsewhere, craftsmen were making fine tables and chests especially, using only local woods and developing along traditional lines their own

# SPECIMENS OF FURNITURE OF MANY PERIODS



The photographs in this and the facing page show the development of household furniture from early Egyptian times to the 18th century. Immediately above is an early Egyptian chair with an open-work back carved in the form of the god Bes. On the right above is a bas-relief showing a Roman and his wife taking a meal, seated in armchairs at a small table, beneath it is a 13th-century English oak chest.

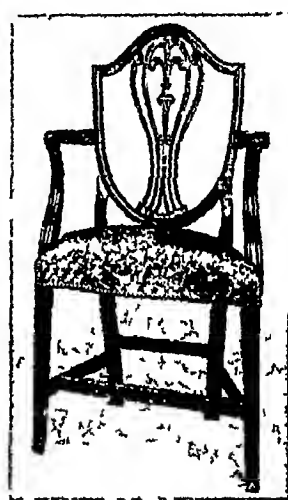
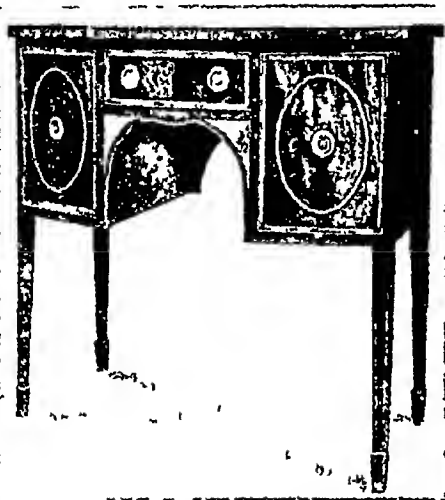
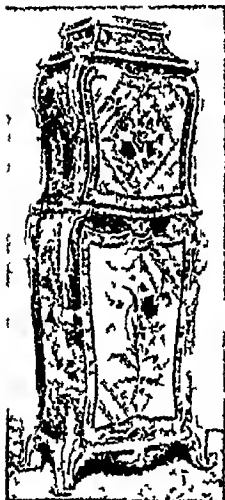
*Photos British Museum Musée S. Germain (Archives photographiques) and Victoria & Albert Museum*



On the left is a Tudor four-poster bed, dating from the end of the 16th century. It is of carved walnut, and the posts at the foot are apart from the frame. Immediately above is an English oak chair of the 17th century.

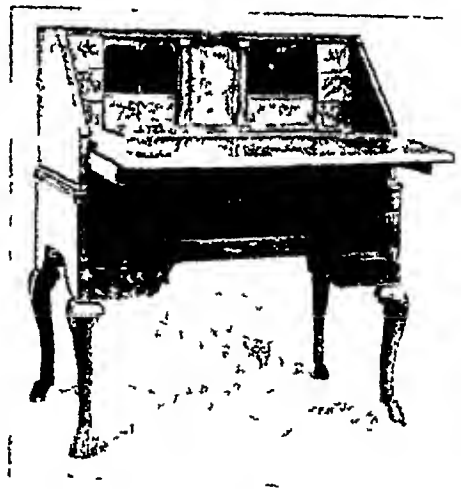
*Photos Victoria & Albert Museum*

## FROM ANCIENT EGYPT TO GEORGIAN ENGLAND



The three photographs at the top of the page are left, a pedestal secretaire in marquetry, period Louis XV centre, a Sheraton sideboard of mahogany, inlaid with satinwood, and right, a Hepplewhite walnut armchair of the late 18th century

*Photos: Victoria & Albert Museum and Gill & Reigate Ltd*



The photograph above shows a room decorated and furnished in the Georgian style with paneled walls, a richly ornamented ceiling and pediments over the door and chimney-piece. The furniture is Chippendale. On the left is a 17th-century walnut bureau. Courtesy of "Country Life" (above) and Gill & Reigate Ltd

## FURNITURE

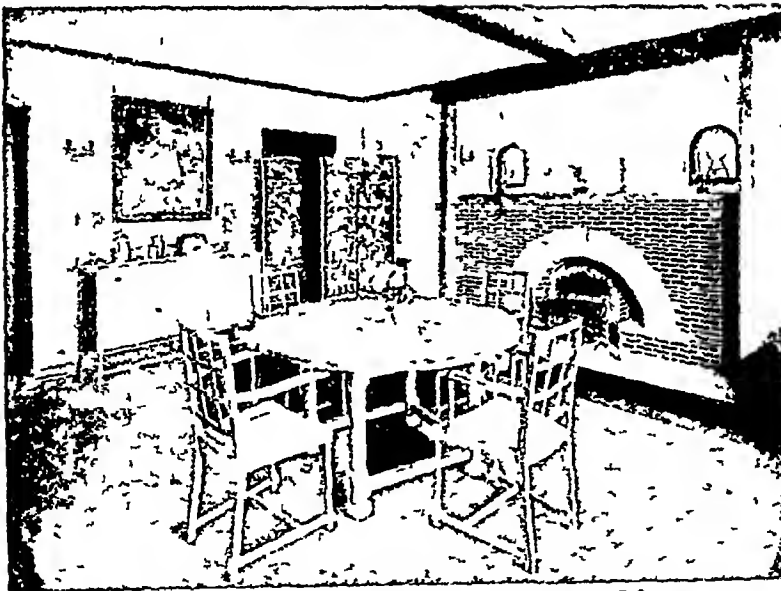
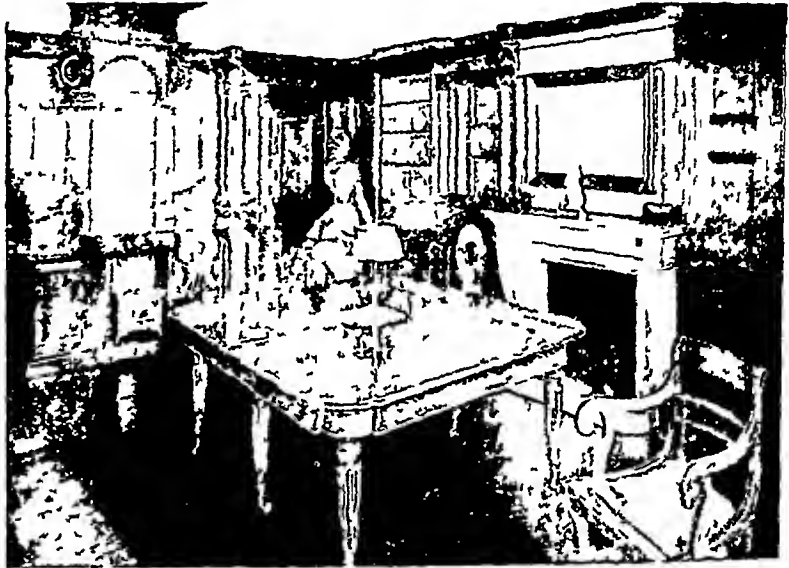
national style English chests, inlaid with scenes done in several woods, sometimes dyed various colours, huge, sturdy refectory tables, used especially in monasteries, smaller chests for churches and large houses, sturdy oaken chairs with turned legs, all these and other minor pieces, besides such large things as bedsteads, were produced by craftsmen, and showed the development of styles from the useful Tudor to the more ornate Jacobean. It was after the Restoration, however, that the first great period of English furniture making began. This came about with the increasing use of walnut, not merely for inlaying but for whole articles, usually as veneer but sometimes in the solid.

"The Age of Walnut," as the beginning of the 18th century came to be called, did indeed produce much superb furniture, especially chairs, small tables and the lighter types of bureau and bookcase. It showed, as might be expected, a good deal of Dutch influence. Walnut was succeeded, with a complete change of designs, by the period of mahogany, which we know as Chippendale.

Thomas Chippendale, the first and greatest of

our individual furniture artists, devoted his life to preaching the gospel of beauty in furniture and to producing chairs, tables, and other articles that were strong as well as handsome.

Chippendale's work, reinforced by his famous book on furniture making, revolutionized the whole trade in England. About the same time Robert Adam and his three brothers were doing an almost equally important work in making the house and its decorations and furnishings an artistic whole. Though they were architects by profession, these men designed furniture of all types to fit the beautiful houses they created. Their chief influences, however, came from



### FURNITURE CHANGES IN FIFTY YEARS

Top is a Victorian study, with paneled walls, of about the year 1875. Below, a modern dining-room in weathered oak. Notice the absence of heavy ornament and elaborate carvings or mouldings in the modern room. "Fitness for purpose" is the modern trend; the furniture is neither so solid or heavy as in the upper picture, and light and space are better studied.

Top: Geoffrey Museum, lower: H. & T. Joel

without, notably from Italy and France, and they tended still further from the use of English woods. Their work influenced George Hepplewhite, whose best designs combine lightness with usefulness and simplicity.

Sheraton went further than any of his predecessors or contemporaries in the direction of delicacy, harmony, balance, and lightness. Some of his later work, however, is marred by extravagance and fantastic forms, and a great deal is too flimsy for any but drawing room use. From time to time, too, the use of gilt and marquetry, and metal and marble, by the great



## FURNITURE



### ESKIMO WOMAN PREPARES HER FUR COAT

As a protection against the biting cold of a Greenland winter the Eskimos wear clothes made from the skins of the seal reindeer and bear. This Eskimo woman is engaged in laying out a bearskin for stretching after which it will be hung on a drying-rack before being made into a warm coat—or possibly several.

French designers—such as Boulle—had much influence, and at the end of the 18th century and start of the 19th this was especially the case.

In 1815 the steam lathe was first applied to the making of furniture, and in 1825 the circular saw was invented. Furniture, which formerly had been very plain, was now covered with elaborate, meaningless scroll work and mouldings, easily produced by the new machinery. Since 1859 most furniture has been made by machines which cut, polish, and even assemble the articles. Some of the polishing of furniture is still done by hand, but there is very little individual construction work.

In the last generation, largely inspired by the work of the English artist, William Morris, there has been a growing demand for a revival of the individually produced pieces of original design. Chief among designers of the Morris period is Ernest Gimson, who did much fine work.

The woods used in making furniture are varied, and change as often as do the designs

## FURS

from oak, beech, and holly we passed to walnut, thence to mahogany and satinwood, and now again oak, maple, ash, and sycamore are popular, with birch and many rare imported woods for inlay and veneer use.

**Furs.** To anyone with a spark of imagination the word "furs" conjures up romantic visions—of remote lands and waters, of savage warriors and lonely trappers, of Arctic travel and hardships, of lovely ladies and wealth beyond calculation. The skins of fur-bearing animals are bound up with the history of nearly all civilized peoples. Wherever winters were cold, one of the first concerns

of primitive Man was to provide himself with garments made from the warm thick coats of animals, for garments of skins and furs were worn long before he had learned to prepare wool.

For furs he hunted and toiled, and when he had obtained more than he needed for himself, he bartered them to his fellows for food and weapons. Thus furs became an early medium



### FUR TRAPPER ON HIS ROUNDS

The trapper baits and sets his traps, perhaps 100 or more, over a wide area, and then comes the job of inspecting them one by one to collect the catch, or rebait those that have been robbed by the craftier animals. Often he will discover more likely spots for placing traps which have been left untouched.

Canadian Official News Bureau

## FURS

of trade and exchange, and as the people of more temperate regions came to covet them for ornament as well as warmth, the fur trade became one of the chief of primitive industries.

To get the rarer and more beautiful skins, men have dared the dangers of the jungles, of the tropics and the trackless wastes of Arctic snows. Tribes have fought with tribes and nations with nations for the sake of furs. In their never-ending demands for furs men have mercilessly hunted some of the most prized species, until such animals as the beaver, the fur-seal, and the sea otter were threatened with extinction. In all ages the more costly furs have been the badge of wealth and dignity. In the Middle Ages the snowy white ermine with



FEEDING TIME ON A FOX FARM

Here are some fine specimens, part of a stock of 160, bred near Canterbury. A powdering of silver in the glossy, bluish-black coat much increases the value of the fox's fur.

its black-tipped tails could be worn in England only by members of the royal family, but ermine today is used in nearly all state robes of judges and members of the court.

The colonization of North America is inseparably linked with the fur trade, the Hudson's Bay Company being the chief agency. The first settlements were mere trading-posts, to which the Indians brought the furs they had trapped, and bartered them for guns and other articles. Other pioneers followed in the trail of the fur-trader, settled at or near the trading-posts, and thus formed the nucleus of many of the great cities and thriving towns of today.

The increasing demand for furs caused prices to rise very considerably at one time, and one of the results of this was the rise of the industry of fur farming. The most notable example of this new industry is the breeding of the silver fox in many northern countries, and even in Britain. When the value of this new enterprise was realized, wild speculation inflated prices until a pair of silver foxes for breeding brought as much as £2,800. Today no such fantastic prices rule, for the fur trade has quickly learned to discern the difference between "domestic" and "wild" silver fox furs. Other varieties of foxes, mink, racoons and skunks are now bred on farms that imitate as nearly as possible the natural homes of these animals. The musk-rat, imported for "farming" purposes into Europe from N. America, has caused untold damage to vegetation, fruit trees, river and canal banks. Escaping from "farms," these animals have bred in enormous numbers and musk-rat farming is now forbidden.

### 'Imitation' Furs

Another result of the increasing demand has been the dyeing and counterfeiting of inferior skins to resemble the better varieties. The furs of the domestic cat and wild rabbit masquerade under a variety of names, but can be sold only with an indication of their true origin. White rabbit fur is prepared to imitate ermine and chinchilla. Clipped and dyed musk rat pelts are sold as "Hudson Bay seal," sable, and otter.

The otters furnish the most durable of all furs. Beaver, seal, racoon, skunk, Persian lamb or astrakhan, and fox follow in order. The rabbit is the poorest of all, being reckoned as only one-twentieth as durable as otter, but owing to the great number of rabbits an abundant supply is always ready at hand.

The following are some of the principal furs, with the sources from which they are obtained.

Astrakhan	New born lambs from Astrakhan (Russia)
Badger	N. America, Europe, Asia
Beaver	Throughout North Temperate Zone
Caracal	Africa and Asia
Chinchilla	Peru, Bolivia, Chile
Ermine	Stoats in their white winter coat from N. America, Siberia
	Polar regions
Fox, blue	
Fox, cross grey, red	N. America
Fox, silver	N. America, Siberia
Kolinsky	Polecats from Siberia, China, Japan
Lynx	N. America, Europe, Asia
Marmot	N. America, Asia
Marten	Europe, N. Asia
Mink	N. America, Russia, China, Japan
Musk-rat	N. America
Opossum	Australia, United States
Racoon	N. America
Sable	Siberia, China, Japan
Seal	Bering Sea
Skunk	N. America, S. America
Squirrel	Siberia, China
Wolf	N. America, Russia, Asia



OUR capital G is derived from the Latin C which, as we have learned, is a rounded form of the Greek *Gamma*. Until the middle of the 3rd century B.C. the letter C was used in Latin inscriptions to denote both the c and g sounds, and throughout the whole of Roman history C remained as the symbol for G in the abbreviations C and Cn for "Gaius" and "Gnaeus". But because of the inconvenience of not being able to distinguish between the two sounds of the character C a slight modification was made for the g sound. The new letter G occurs in a famous epitaph on Scipio Barbatus, who was consul in 208 B.C. The monument on which his epitaph appears is one of the treasures of the Vatican. Plutarch says that the new symbol was invented by Spurius Carvilius Ruga who spelled his family name R V G A instead of R V C A (the V still being used on stone inscriptions and wax tablets for the sound which we represent by U). At first the capital G was so much like C that you could hardly tell the difference, the lower lip of the crescent merely rising up in a straight line. In a later form this was curved inward, and in time became the little cross bar of the G we know as in *go*, *gave*, *glad*, and "soft," as in *gem*, *gentle*, *age*. In modern English G has two chief sounds "hard," in this work the soft "g" is represented as j.

**Gaels AND GAELIC** The Gaels were those people of Celtic origin who occupied our country at the dawn of its written history and disputed its possession with the Roman legions. Their descendants live on in the Highlands of Scotland, where the Gaelic language may still be heard. Similar languages are spoken in Wales and in Ireland, and to these the name of Gaelic is also sometimes applied.

Gaelic is a difficult language to learn, on account of its pronunciation, so that its literature, which is rich in songs and folktales, is a closed book to most people. Yet even a slight knowledge of the language is valuable to the traveller in Scotland, for most of the place names are derived from Gaelic. Names like *ben* (or *beinn*) or *cairn* for mountain and *cnoc* for hill, *strath* for a wide valley and *glen* for a narrow one, *dun* (or *dum*) for a fort, *lil* meaning cell, and usually found associated with a saint's name, *aber* meaning the confluence and *inver* the mouth of a river, are found scattered all over Scotland.

### Gainsborough,

THOMAS (1727-1788)

"Should England ever become so fruitful in talent that we can venture to speak of an English school, then will Gainsborough's name be handed down to posterity as one of the first." In these words did Thomas Gainsborough's greatest rival, Sir Joshua Reynolds, pay him tribute, which the opinions of later generations have considered fully justified. For although there will always be argument as to which of these two was the greater painter, no one will dispute Gainsborough's position as a founder of the English

school. It was as a country lad that Gainsborough first began to paint, depicting the trees and streams and landscapes of his native Suffolk, and it was as a landscape painter that he always liked to think of himself. Yet his portraits brought him fame and fortune, and it is still as a portrait painter that we inevitably consider him in a study of English art.



THOMAS GAINSBOROUGH

Possessed of what is called "the artistic temperament," very lively, and an insatiable worker, Gainsborough appreciated the good things of life—music and drama as much as painting.

Self portrait. H. L. Agnew & Co.

1745 returned to Sudbury. He soon married, in 1746, Margaret Burr, a lovely young lady whose private income enabled the young couple to set up house on their own in Brook Street, Ipswich. At this time Gainsborough painted many small portrait groups. These are as delightfully simple and pastoral as his later work was brilliant and true to the life of the city. He moved to Bath in 1760, and there he attracted many sitters among the rich. His fame quickly

## GAINSBOROUGH



### IN GAINSBOROUGH'S GRAND MANNER

In this portrait of the Duchess of Cumberland, we have an example of the sort of portraits in which Gainsborough excelled—portraits representing the great ladies of his day with aristocratic mien. This particular work, however, reveals the slightly superficial style of his last years.

*National Gallery of Ireland*

spread to London, and he was made one of the original members of the Royal Academy at its inception in 1768

Gainsborough, who was always abrupt, rude, and tactless in manner, quarrelled with Reynolds in 1772 and for four years refused to exhibit at the Academy. But shortly after his arrival in London, in 1774, he was appointed painter to the king, and his prosperity was assured, his studio was crowded with sitters, and he was unable to keep pace with the demands made upon him. His sitters included George III, whom he painted eight times, the great statesman, Pitt, of whom he made seven portraits, and the great actor, Garrick, of whom he made five, and, in fact, all the great men and women of the day sat to him. But even at the height of his prosperity Reynolds' prestige was a thorn in his side, and his own naturally nervous temperament was an even greater hindrance. Gainsborough quarrelled once more with the Academy in 1783 and he never exhibited there again. He died at his own home in London, August 2, 1788.

To say that you can always tell a Gainsborough painting at first glance may be an exaggeration, but there is no doubt that the great majority of his works are very easily

## GALAHAD

recognized. His great full length portraits of English ladies, for example, are quite unlike the works of any other painter. Pale silvery blues, greys, and greens in the foreground and on the sitter's clothes attract the eye, while the brown and deeper greens and blues of the background often make the portrait into a real picture as well. In his landscapes his command of colour and understanding of Nature are seen to the full. But his aloofness to his sitters, with whom he was never on any but business terms, and his natural diffidence and rural upbringing show themselves again and again in his paintings.

**Gal'ahad.** The faith and purity of life of Sir Galahad gave him powers denied to the other knights of King Arthur's Round Table, and it was this spiritual strength that enabled him to find the Holy Grail, the cup used by Christ at



### GALAHAD THE PURE OF HEART

The story of Galahad is told in several ancient romances both English and French. You can read about him in Sir Thomas Malory's 'Morte d'Arthur'. This picture of him by the Victorian master, G. F. Watts, is at Eton College.



### GALILEO EXPLAINING THE HEAVENLY BODIES

Galileo's most brilliant work consisted in laying the foundations of mechanics as a science and in disentangling from the confused notions and fallacies of his time the rôle that cause and effect play in the movements of the heavenly bodies. But for the idea, which constantly hovered at the back of his mind, of a universal force of gravitation, Newton's work might not have been possible. Here you see Galileo entertaining some visitors to his observatory.

*Pisani Gallery, Florence*

the Last Supper. This sacred vessel, so the legend runs, had been brought to Britain by Joseph of Arimathea, but when the land fell into wickedness it was hidden away, and the search for it became the quest of King Arthur's knights.

One day, when the knights were talking of the Holy Grail, the torches in the great hall went out. Across the darkness streamed a band of silver light. Against that, faintly as through a mist, they saw a flush of rose. Only Sir Galahad saw the sacred cup clearly—"all crimson and glowing like a ruby," and heard a voice which said, "Galahad, follow me."

All the knights of Arthur's court swore a vow to live a holy life for a year and a day, while they searched for the lost Grail. Only four returned. Sir Bors and Sir Lancelot had seen the Grail in blessed visions. Sir Perceval had seen it because he was Galahad's friend, and next to him the purest in heart. After long wandering he had found Galahad in prayer in a hermit's cell, "clad in silver armour, and with a face like an angel's."

"Oh, my friend," said Galahad, "the Holy Grail shines always before me, blood-red, and glowing like a star, guiding me to Heaven. It gives me victory over every sin and shame

and wrong in the world. Come with me!" The Knights went out into a storm, and over a hill top Galahad ran before, across a bridge which spanned a black marsh, to the sea, and was seen no more. As Perceval knelt, weeping and praying, there came the beam of silver light, and on it the glowing Grail.

In the morning he found Galahad's body, beautiful, thin and worn as a saint's, and buried it by the sea.

The story of Sir Galahad is treated in Malory's "Morte d'Arthur" and in other medieval romances. It is also the theme of Tennyson's "Sir Galahad," and "The Holy Grail" in his famous "Idylls of the King." (For other stories see also articles on Arthur and Round Table.)

**Galileo.** (Pron gal-i-lā'-ō) (1564-1642) The first astronomer to use the telescope for examining heavenly bodies, the discoverer of the pendulum's laws, and the founder of modern physics, was Galileo Galilei (usually known as Galileo). He was born in Pisa, Italy, February 15, 1564, and died 78 years later, January 8, 1642, in the year of Newton's birth.

When Galileo was a youth of 19 he saw a lamp in the cathedral at Pisa swinging regularly



## GALILEO

He realized—what no one had realized before—that a pendulum swinging to and fro could be used to measure time, and so laid the foundation for the invention of the modern clock (See Pendulum) He dropped objects from the Leaning Tower of Pisa, and proved that falling bodies, however heavy or light, fall at the same rate (See Gravitation) He held the professorship of mathematics in the universities of Pisa and Padua, in 1610 he left Padua for Florence, where he spent most of the remaining portion of his life

Galileo made his first telescope with a piece of organ pipe, placing a lens at either end. It magnified only three times, but later he made a telescope that magnified thirty times (See illustration on page 324) With these he saw the mountains on the moon's surface, found that the Milky Way was a mass of very faint stars, and discovered the four largest satellites of the planet Jupiter and the peculiar appearance of Saturn, later shown to be due to a series of "rings" What he saw through his telescopes also convinced him of the truth of Copernicus's view that the earth rotates on its axis and revolves round the sun, and his ardent support of this view was the cause of difficulties with the Church. In 1616 he was given a formal warning, but nevertheless he again aroused the anger of the Church authorities by publishing a book entitled "Dialogue of the Two Great Systems of the Universe" For this publication he was summoned before the Inquisition in October, 1632. No one knows what happened during his examination, but we do know that he formally admitted that his views were wrong and was compelled by the tribunal to live in strict seclusion for the rest of his life. The well-known story that after recanting he remarked, "All the same it (the earth) does move," is an invention. In his retirement he published what is perhaps his most valuable book, "Dialogue of the New Sciences," in which he summarized his lifelong studies on the principles of mechanics.

Galileo achieved his greatest reputation as an astronomer, but it is for his discoveries in mechanics that he chiefly deserves fame. Brilliant alike as observer and experimenter, he was also a pioneer in the calculation of results

## GALSWORTHY

and their interpretation, and, although he did not define them, it is evident from his writings that he appreciated the laws of motion enunciated by Newton. He was the first to have any concrete idea of force as a mechanical agent, and in this also he did much to clear the ground for Newton.

**Galsworthy, JOHN** (1867-1933) Galsworthy recreated a world which he knew and which died during his lifetime; he peopled it with its familiar characters rather than with types, and he used those characters in their inevitable conflicts to convey a philosophy in which forgiveness and revolt have equal part.

He was a great depicter of the upper middle class and his theme was pity for the underdog.

Born August 4, 1867, at Coombe, Surrey, he came of an old and well-to-do family. Like many rich men's sons, he went to Harrow and Oxford and passed his Bar examinations with no particular intention of practising. Having ample means, he travelled much, and on one of these journeys met a young Polish merchant service officer, Joseph Conrad, who confided to him a manuscript afterwards published as "Almayer's Folly."

Galsworthy's great year came in 1906, when the first of the Forsyte novels, "The Man of Property," appeared, and his play "The Silver Box," was produced. The novel launched him on his

career as a social historian; the play placed him at once among the first dramatists of his time. From this year onward Galsworthy continued his double career of novelist and playwright. He had founded in "The Man of Property" that background of a rich, upper middle class England which was to serve for a long series of novels later known as the "Forsyte Saga." The most important of the successive Forsyte novels, as they followed "The Man of Property" at a long interval, were "In Chancery" (1920), "To Let" (1921), "The White Monkey" (1924), "The Silver Spoon" (1926), "Swan Song" (1928), "Maid in Waiting" (1931), "Flowering Wilderness" (1932), and, published after his death, "Over the River" (1933). There was also the slighter "Indian Summer of a Forsyte" (1918). Others of his novels were "The Country House" (1907), "Fraternity" (1909), "The Patrician" (1911)



Clive Edis

### JOHN GALSWORTHY

Galsworthy's novels depict the life of the upper middle class during the first thirty years of the 20th century. The themes of many of his plays were the social injustices of the same period.



and "The Dark Flower" (1913). He also wrote volumes of short stories, including "On Forsyte Change," and essays and some poems.

Of his plays, "The Silver Box" was followed in 1909 by "Strife," a powerful exposure of the uselessness of strikes. The most impressive of his social dramas, "Justice," exposing the horrors of the existing prison system, was produced in 1910, and, more than any other of his works, resulted in some immediate reform of the evils he portrayed.

After the World War Galsworthy returned to the theatre with renewed powers. "The Skin Game" was produced in 1920, "Loyalties" in 1922, and "Escape" in 1926. The first dealt with the conflict between that settled class of the author's origin and the new rich, the second with the eternal struggle between Jew and Gentile, and the third with the reactions of a normal world to wards a hunted convict.

Galsworthy died January 31, 1933. He refused a knighthood, and was awarded the Order of Merit in 1929. The success of "Justice" had shown him that he could wield an influence in the direction of practical reform, and he played a large part in the campaign for the humane slaughtering of animals. His deep desire to promote a better international understanding led him to give much time and devoted work in the interests of the P.E.N. Club, an association of authors of all nations. In his private life he was shy, but he was accessible to all cases of distress and sympathetic to all young authors.

**Galvani, Luigi** (1737-1798). In 1790 Luigi Galvani, when a professor of anatomy at the University of Bologna, and in the course of some experiments on "animal electricity," hung a dead frog over an iron balcony railing by a copper hook through the frog's back. The creature's body was at once convulsed by lively twitchings. Galvani's conclusion was that the frog was a kind of naturally charged

Leyden jar, with negative electricity on the exterior surface of the muscles which discharged through the iron railings, and positive electricity along the nerves of the interior which discharged through the copper hook.

Galvani's published experiments and deductions aroused great interest and much controversy. His work "On the Force of Electricity in Muscular Movement" was published in 1791. He died, December 4, 1798.

The voltaic pile, cell, and battery are sometimes called "galvanic" in honour of the man whose dead frog started the inquiry, and the current

they generate was long known as "galvanism."

Galvani is also remembered in the "galvanometer," the instrument that measures electric current, and in "galvanized" iron, which is iron coated with zinc to prevent it from rusting. This coating was formerly applied by "galvanic," or electrolytic, methods, though it is now more commonly given by dipping the iron in a bath of molten zinc.

**Galway, Co. of EIRE.** Galway is one of the most wild and beautiful of all the counties of Eire, and only 168,000 people live in its 2,370 square miles. The eastern part of the county is flat and boggy, but the western region on the Atlantic seaboard contains several mountainous districts, including Connemara, with the Twelve Pins and Lough Corrib, Joyce's Country and Iar Connaught. Off the coast, in Galway

Bay, are the Aran Islands, the home of hardy fisherfolk. Galway (pop., 14,000) is the county town and a calling place for big liners, in Connemara is Clifden, where Alcock and Brown landed after the first non-stop Atlantic flight in 1919. Agriculture and fishing are the main industries.

**Gandhi, Mohandas Karamchand** (Pron. gun' dē) (Born 1869). Saint, ascetic, political leader and religious prophet, Gandhi is India's best-known and most influential citizen. By his millions of followers he is called "Mahatma."



AN EXPERIMENT BY GALVANI

Luigi Galvani is here seen demonstrating the effects of electricity on the muscles of a frog to a pupil and a girl, whose expressions betray their intense interest in the master's experiments. The application of an electric charge produces muscular twitchings in the frog's limbs, the impulse travelling to the muscles along the nerves.



### GANDHI ON HIS WAY TO CONGRESS

This simple scene, typical of the unceremonious nature of the man, shows the Mahatma (front, right) on his way to a session of Congress, accompanied by his followers. When not actively engaged in political affairs, Gandhi sits cross-legged working at a spinning-wheel, and in this attitude receives many exalted visitors from Western lands.

—the Great Soul This Hindu apostle of *swaraj*, or home rule, is only a frail little man, but he has so impressed the world by his courage, sincerity and intense patriotism that even people who disagree with his political and economic ideas are outspoken in their respect for him.

Gandhi was the son of a native government official at Porbandar, in the Bombay area. Having studied law in London, he began his legal career in Bombay, and after a visit to South Africa in 1893 settled there and soon built up a large practice. In 1894 he founded the Natal Indian Congress and began agitating both in South Africa and India for Indian rights in the South African colonies. In 1899, during the Boer War, he offered his services to the South African government, raised an ambulance corps, and served in several actions. Similarly, in 1906, he served the government during the "Zulu revolt." He gave his time freely to anti-plague work, to promotion of peace between capital and labour, and to improving racial differences. The influence of Ruskin and Tolstoy became a decisive factor in his life. He finally renounced his law practice and took a vow of poverty.

In 1906, during the agitation in South Africa for a law excluding Asiatics, he led in a "passive resistance" struggle, and was twice imprisoned. Nevertheless, at the outbreak of the World War he went to England and raised an ambulance corps, mainly of Indian students. Later he

returned to India and was recruiting volunteers when news of the armistice came.

Gandhi had hoped by these evidences of loyalty to secure full equality in the British Empire for his country. But the passing of the Rowlatt Acts in 1919, conferring on the government dictatorial powers to deal with conspiracies and revolution, dashed these hopes and precipitated a more or less violent campaign for self-government. Gandhi became its chief leader. For several years he had been gradually gaining a hearing among all classes of Indians through his writings and his reputation as a saint. Although born a Jain, the strictest sect of India, he developed a tolerance which embraced men of all faiths and led him to work for goodwill and common understandings, particularly between the fiercely intolerant Hindus

and Mahomedans, as a first step toward self-government. This tolerance also caused him to advocate improving the conditions of the so-called "pariahs," or outcast classes. For several years he led the National Congress, which worked for political separation from the British Empire. He advocated non-violence (passive resistance), non-cooperation with the government, and the boycott of Western goods and ideas as the methods of securing *swaraj*.

### Campaign of 'Civil Disobedience'

Gandhi's attempt from 1920 to 1922 to put these ideas vigorously into effect resulted in scenes of disorder and violence. He was tried and sentenced to six years' imprisonment, but was quickly released when the campaign of "civil disobedience" died down.

In 1929 the storm broke out afresh. Strikes, boycotts on foreign-made goods, and rebellion against the salt tax caused more violence. Gandhi led a picturesque "march to the sea" to defy the government's salt monopoly by making salt from sea water. He was again imprisoned for several months and again became a popular hero and the recognized spokesman of national sentiment. In 1931 he went to London to take part in the Round Table Conference on India. When the conference failed, he returned to India and revived the civil disobedience campaign. He was imprisoned again in 1932, but when he entered upon a "fast unto death," he was released to save his life. In 1934 he resigned the

presidency of the Indian National Congress. Thereafter he was less active in politics, but he continued to work for the spiritual and physical welfare of his people, especially by promoting native industries.

**Ganges.** (Pron gan' jēz) Born in northern India in an ice cave beneath the Himalayan snows, the Ganges, the sacred river of the Hindus, breaks through the last mountain barrier just above ancient Hardwar. A shallow, rapidly falling stream before it gains the flow of its many tributaries, the river keeps to a southeasterly course through the land of the little talkative Jats, busy in *gram* (chick pea) and indigo fields, to Cawnpore, scene of the terrible massacre during the Indian Mutiny of 1857.

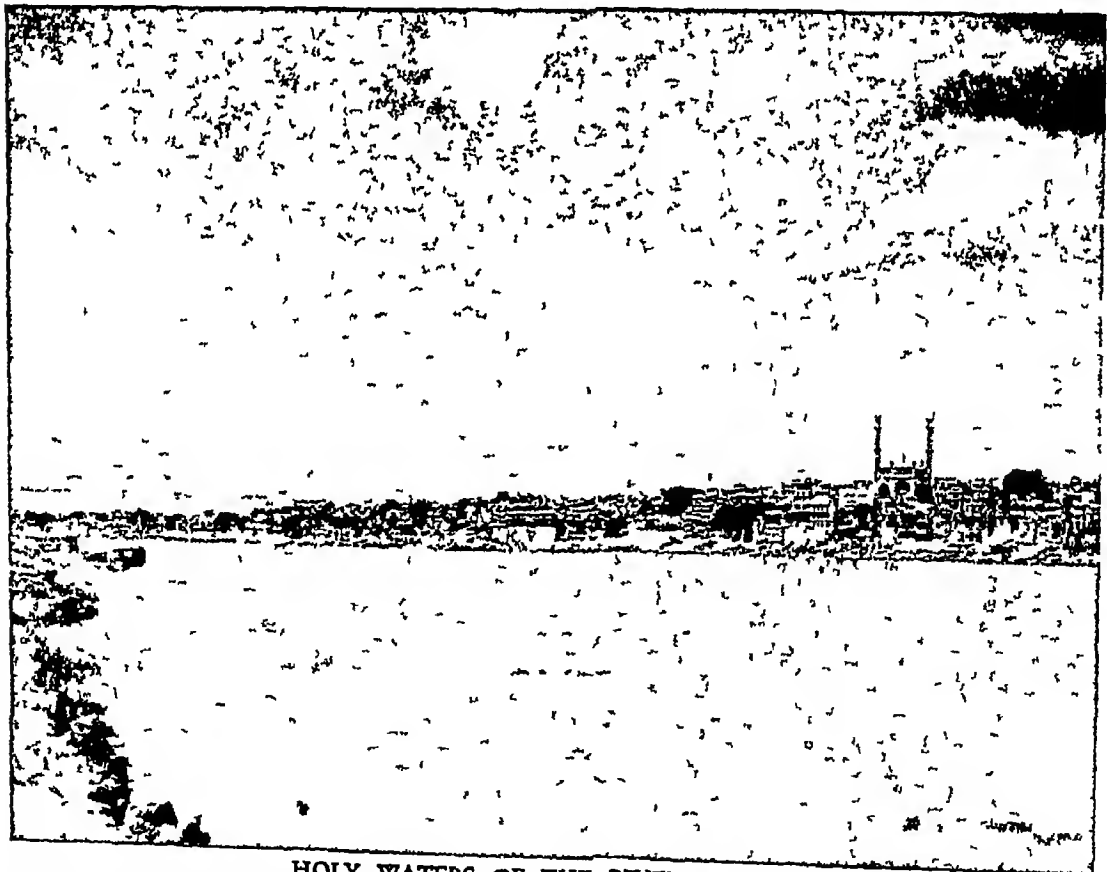
Half-way on its journey through the most densely populated region of the world, the Ganges is joined by a sister stream, the Jumna. Their *doab* (land between two rivers) is irrigated by two elaborate and costly canal systems fed from the Ganges. Allahabad, on the point of land thrust out into their united swirling waters, is a holy of holies to the Hindus, where the festival known as the "Maghmela" is held. Here the river becomes deep enough to bear all sorts of small native craft, and it is navigable

throughout the remainder of its 1,550-mile journey to the sea.

In a great circle the powerful stream sweeps past Benares. The banks are crowded with temples, whose *ghats* (steps) swarm with pilgrims of every caste and rank, struggling to wash away their sins in "Mother Gunga," to cast the ashes of their dead into its current, or to capture a small phial of its purifying liquid to carry back to distant homes.

Swelling with the force of new tributaries, the Ganges flows past village and city until it meets the powerful Brahmaputra, whose black load of silt assists in the unceasing building up of its extensive delta. This delta begins more than 200 miles from the Bay of Bengal, and the river stretches myriad fingers of tiger-infested crocodile swamps southward to the sea. Chief of its channels is the Hooghly on the west, it bears majestic ocean liners 80 miles to busy Calcutta, but constant dredging is needed to keep it free of silt.

India worships "Mother Gunga" just as ancient Egypt deified the Nile, because it gives life to the millions that swarm upon the 390,000 square miles of its fertile basin. When the tropical summer rains beat down, all the



#### HOLY WATERS OF THE RIVER GANGES

One of the chief articles of the Hindu creed is veneration of the Ganges, and over 200 million Indians are numbered among its devout adherents. Above is a panoramic view of Benares, the city of Hindu piety, with its frontage to the river lined for miles with bathing ghats, terraces, and magnificent temples. Every year pilgrims come to bathe in the sacred waters.

Indian Railways Bureau

## GANGES

tributaries of the Ganges roll in a flood down to the holy river. The muddy waters creep across the broad flood-plain, mile upon mile, deepening to 60 feet in places. When the rains have spent their force, the deluge recedes, leaving a new layer of rich soil on millions of tiny farms. Rice, wheat, cotton, jute, spices, and other crops spring from the soft warm loam, feeding almost as many people as live in both North and South America, and producing a rich surplus which is exported to all parts of the world.

**Gannet, OR SOLAN GOOSE** This sea-bird (*Sula bassana*) is a very remarkable creature. It is vaguely like a gull, but bigger, and far stronger, with stream-lined body, big, broad-webbed feet, and a long, dagger-like beak, with which it catches fish by swooping on them from a great height. Gannets nest in enormous numbers in a few sites, as the island of Grassholm, and the Bass Rock in the Firth of Forth. Such places, during the breeding season, are so covered with the birds that they gleam white for a distance of many miles. You would find it difficult indeed to walk between the nests. Immature gannets, of which there is one to each nest, are brownish in colour, and, when covered with their first woolly

## GARDEN CITIES

down, look very remarkable indeed. The gannets of Grassholm were the subject of one of the finest nature films that have ever been made.

**Garden Cities.** With the discovery of steam-power, the present industrial age may be said to have commenced. Britain with her wealth of coal and colonial sources of raw material quickly became the leading industrial nation, the workshop of the world, in fact. In every town situated near the railway or the navigable rivers and canals, new industries sprang up. The rural population forsook the soil and flocked into these hives of manufacture, where wages were higher and tenure of employment more secure than on the farm. Soon small towns became big cities, spreading ever outwards and upwards, without regard to sanitation, hygiene or comfort. Mortality and disease statistics mounted higher in proportion to the overcrowding. For nearly a century this process of depopulating the countryside and overcrowding the towns continued unchecked, so much so, that many manufacturing centres became soon little more than a collection of slums.

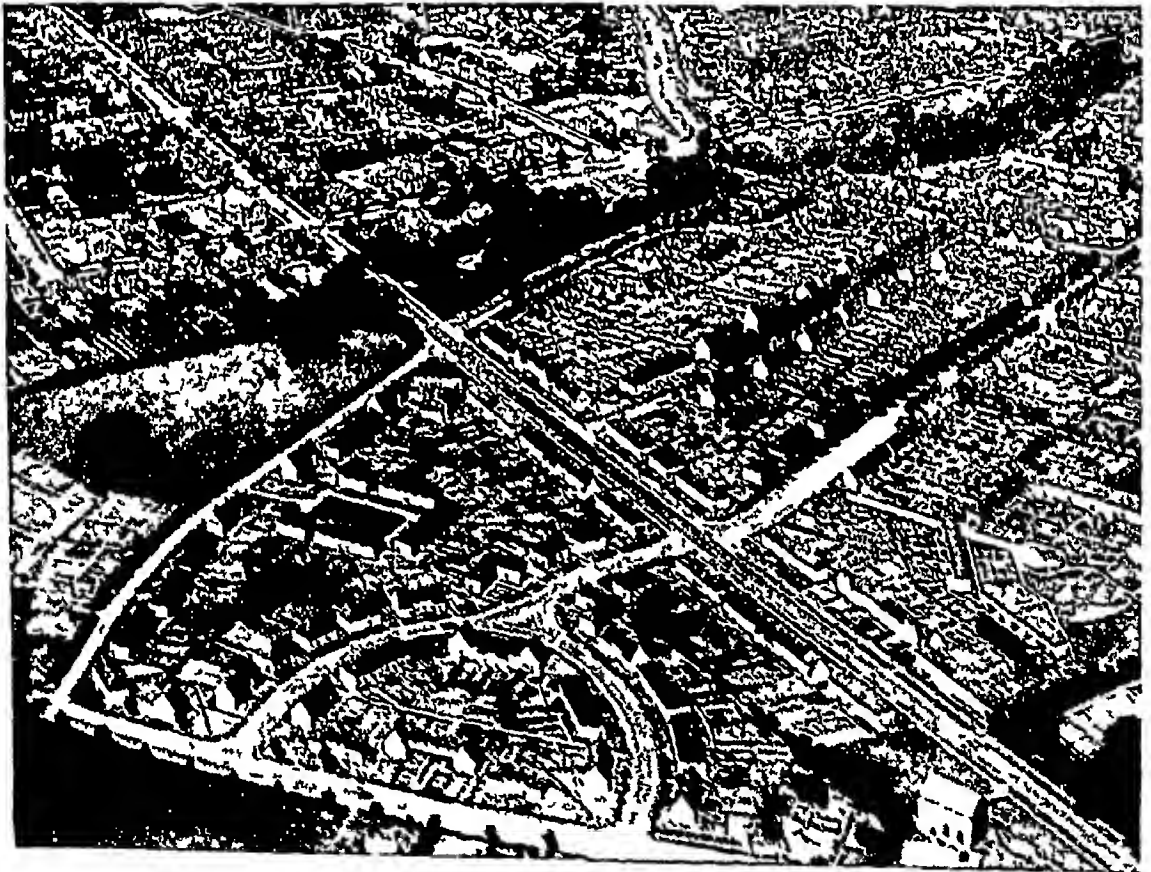
In 1898 Ebenezer Howard advocated that manufacturers, by the acquisition of large tracts of suitable land, might establish themselves and



**GANNETS AT HOME IN THEIR ISLAND CITADEL**

The little island of Grassholm, on the Pembrokeshire coast, is the headquarters of the gannets of the British Isles, and here is a view of a small section of their vast nesting colony. You can see what fine great birds they are, white with black tips to their wings, with a long, strong beak and a long, sturdy neck. In the foreground a bird with its bill open reminds one of a sort of pelican, and, indeed, that strange bird is the gannet's nearest relative.

## GARDEN CITIES IN 'ENGLAND'S PLEASANT LAND'



Above are two excellent examples of the work that is being done by means of garden cities and town planning to bring design, space, and health into our living conditions. The top photograph shows a typical road in Wythenshawe, Manchester's model suburb, where there really seems room to breathe. Still more room is there at Letchworth, not far outside the London area, but almost an independent community. In the lower illustration it is seen from the air. The design is interestingly varied, notice the wide roads, green spaces, and roadside trees.

*Photos Manchester Guardian "Aeroflms"*



their workers under more healthy and economical conditions, and so end the old disgraceful conditions. His suggestion was not too well received by industrialists, but it made headway among serious students of sociology, and in 1899 the Garden Cities and Town Planning Association was formed. Its object, primarily, was to induce capitalists to set up mechanical industries in rural areas, each having a garden city as its nucleus. A garden city was defined as "a town designed for healthy living and industry, of a size that makes possible a full measure of social life, but not larger, surrounded by a rural belt, the whole of the land being in public ownership, or held in trust for the community."

#### New Towns for Old

In the awakening sense of social justice, which was so marked a feature of George V's reign, the Garden City movement received an impetus whose increasing momentum has led to parliamentary and local government legislation to control unrestricted urban expansion. At Port Sunlight and Bournville individual industrial (soap and cocoa) concerns have proved the value of garden cities. Then followed the establishment of Letchworth Garden City in 1904, 35 miles from London, by a joint stock company. Today there are over forty factories there, all within easy walking reach of the workers, who have good houses with adequate sunlight and air-space, gardens and allotments. Shops, schools,

theatres, factories, etc., are built on modern hygienic principles, there is an active social and civic life, and the belt of open country, which surrounds this garden city and cannot be encroached upon, is only ten minutes' walk away.

The success of Letchworth proved an example to be copied. Welwyn Garden City followed, so did others throughout England and Scotland. The Town Planning Act of 1909 and legislation against "ribbon" development—that is, the building of houses and housing estates for subsequent profit along the main highways leading to and from cities—were direct results of the Garden City movement. So also are the plans now being put into operation for the reconstruction of existing towns. Slum areas are being cleared and the population is being transferred, along with existing industries, to "satellite" garden cities spaced round the main industrial centre, but divided from it by a wide green belt of 20 to 30 miles.

Tenement building, which at one time threatened to become the only solution of the problem of city overcrowding, is now being replaced by development on Garden City lines.

France, Belgium, Germany, Austria, Poland, Spain, and the British Dominions, Canada, Australia, New Zealand and South Africa, have followed Britain's lead, and the International Garden Cities and Town Planning Association, formed in 1914, has members in every country.

## The ART and SCIENCE of the GARDEN

*"A garden is a lovable thing"—but it is also a useful thing, and may be made to yield fine vegetables and fruit as well as flowers. Both these aspects of horticulture are considered here.*

**Gardens AND GARDENING** "God Almighty first planted a garden, and indeed it is the purest of human pleasures." This saying of



First Step in Gardening

Francis Bacon has been found true by multitudes of garden lovers since the time when recorded history began. Magical gifts are produced in your garden that cannot be bought at any price—health, wholesome delight, and habits of thrift, industry, and perseverance.

Gardening in its various forms, ranging from the small vegetable or flower garden to the great parks and estates created by the landscape architect, was practised by the Egyptians, the Persians, the Assyrians, the medieval monks,

and the princes and kings of all eras. Until the 16th century most of the practical horticulture of Britain was in the hands of the monks, who were chiefly concerned with the culture of fruit and vegetables for the table, and of medicinal herbs, rather than of flowers. Gardening made rapid strides in the latter half of the 16th century, and the Tudor gardens of that period, blended with the Dutch gardens introduced a century later, form perhaps the basis of modern horticulture. Today the love of the garden has been brought down to the humblest home fortunate enough to have a few feet of ground in which plants may be successfully raised.

Nor need gardening be restricted to adults. The value of school gardens has long been recognized in Europe. They were started as long ago as 1819 in Schleswig Holstein, and before 1880 had been adopted in Austria, Sweden, Belgium and France. Nowadays they are a fairly generally recognized feature, and many school gardens are subsidized by the



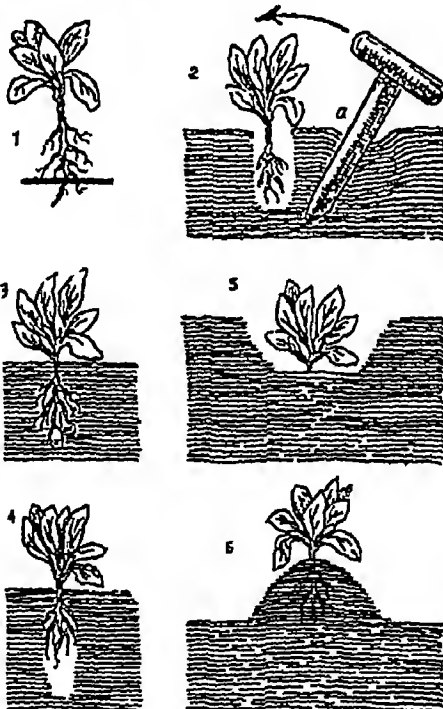
H. A. Malby

### HERBACEOUS BORDERS ALONG A GRASS PATH

In a garden the herbaceous border often consists of perennial plants that is to say, plants whose foliage dies down in the autumn, but which grow up again in the following year. The plants may be left where they are first planted, but they benefit by being transplanted every three or four years. A very large number of plants are suitable to a herbaceous border, and it is often a blaze of colour. The borders shown above gain in effect by being planted on either side of a grass path.

authorities. Boys and girls learn important lessons in Nature study through observing the whole cycle of growth and change in plant life by raising flowers and vegetables in the garden. The educational effect of carrying out, through the whole season, plans for cultivating a garden is one of the best results of good training. The cultivation of plants requires regular attention, forethought, self-reliance, and originality to overcome difficulties. School gardens have an important relation also to industrial education, for they teach children to use implements.

The home vegetable garden may bring you vegetables of a quality and a flavour far superior to that of the vegetables you buy in the shops. The flower garden gives you beauty on which to feast your eyes, both in and out of doors. As one garden lover says,



### HOW TO PLANT CABBAGES

1, Cut off tap-root at or before planting. 2, Place in hole and lever over soil with dibber (a). 3, Correctly planted cabbage. 4, Badly planted cabbage, with space beneath root. 5, How to plant in dry soils. 6, Method of planting in wet soils.

"Your chief joy in your garden will not be in the vegetables that you eat, nor in the flowers that you pick, but in the satisfaction of causing things to grow. You will enjoy the companionship of things that are real and clean. You will come to know the common and the little things. Just to have handled the new earth, and to have sown the seed, and to have thought about the garden—this is worth the effort."

The ideal garden plot is one that is open to sunlight but protected from drying and cold winds. Where possible, a general slope to the south is beneficial. No green plants can live without sunlight, and with few exceptions they demand actual sunlight for part of the day.

The soil is the foundation of the garden. On the basis of how easy they are to

work, soils are roughly classed as light or heavy. Light soils contain a large percentage of coarse-grained sand, and are therefore loose and easily worked. Clay is hard to work because it is very fine-grained and holds great amounts of water. Such a soil can be improved by the addition of sand and decayed vegetable matter.

Before planting, the soil must be well dug, so that the plant roots may penetrate easily and so that water and air may pass through. This may be done either in the autumn, or in the early spring after the winter's snow and frost have disappeared and the ground is dry enough to crumble when it is worked. The

called fertilizers. Farmyard manure supplies these foods and also adds humus, or organic matter. The latter makes the soil light and loose so that the plant roots may penetrate easily, and also helps to retain water.

Standard commercial fertilizers may be substituted if farmyard manure is not available, using about one pound of fertilizer for every 30 square feet of land. If commercial fertilizers are used, as much vegetable matter as possible should be added to the garden soil every year to maintain the supply of humus. Lime is added to correct the acidity of the soil, but gardens should not be limed unless tests show

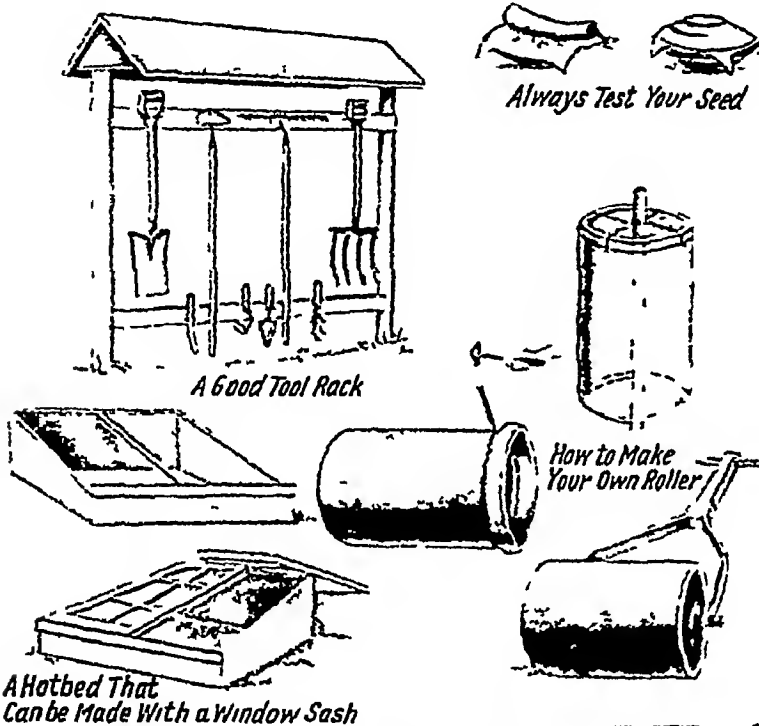
that it is needed. Lime is also added to improve the physical character of some heavy soils such as clay. (See Fertilizers)

There are two important planting times, spring and autumn. Annual vegetable and flowering plants—those that bloom and produce fruits and seeds in a single season—are usually planted in the spring, but almost any annual which is self-sowing can be seeded in the autumn. Annual flowers, especially poppies, cornflowers, larkspur, and even sweet peas, will bloom much earlier if planted in the autumn. Plants that are propagated by means of bulbs, such as daffodils, narcissi, tulips, and others, are planted in the autumn to bloom during the following spring.

The chief rules for transplanting seedlings are (1) Select a cloudy day (2) Give the seedlings a thorough watering before moving them (3) Take up each plant carefully so that its roots will be disturbed

as little as possible, and place it in the hole made with a small stick or dibber (4) Plant the seedling slightly deeper than it grew before, and press the soil firmly about its roots (5) Water immediately after transplanting.

The natural time for any kind of transplanting is in the spring, because then the plants are starting new growth, and their active cell formation will repair damages to the roots. Transplanting trees, shrubs, and other perennial plants in the autumn, however, is practical, except in very cold or dry regions. In moving a plant, always remember that it is a living thing and that cutting or breaking its roots may kill it. Evergreens and most other trees and shrubs should be handled with a large ball



#### HOME MADE GARDEN TOOLS

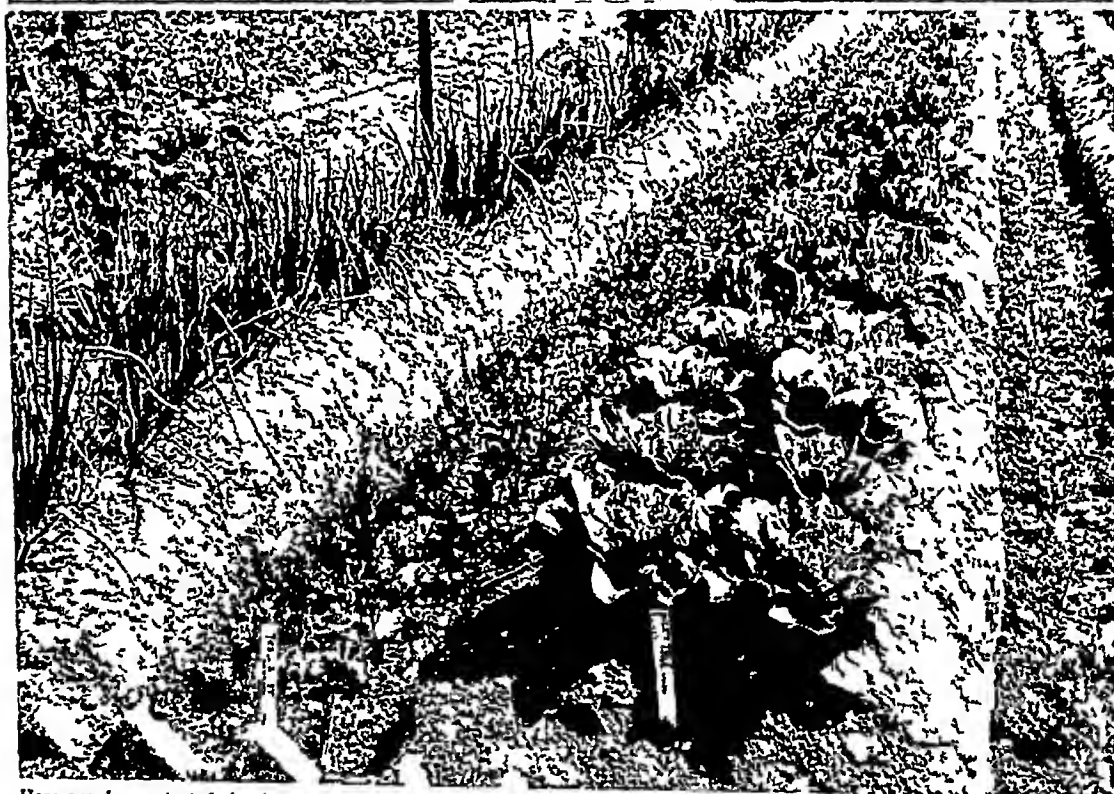
The illustration shows a simple tool rack, china bowls covered with cloth for seed-testing, a hotbed made from a window sash, and a garden roller made from an iron drain-pipe. The flange is cut off the pipe and a smaller pipe projecting at each end is held in position by wires while the drain-pipe is filled with concrete.

The handle is attached to the ends of the smaller pipe.

small garden plot should be dug and pulverized to a depth of two feet or more. This deep tillage of the seed-bed aerates the soil and lessens the need for constant watering. Only after the soil has been raked and made smooth and level are we ready to start planting. Carelessness in preparing the seed-bed is one of the most common causes of garden failures.

Plants, like children, require a well-balanced ration of food in order to thrive. The soil is their cupboard, and this must be well stocked to produce the best crops. There are three elements in the soil necessary for plant growth that often need to be increased. These are nitrogen, phosphorus, and potassium. The materials we use to supply these elements are

# PLANNED GARDENS FOR FLOWERS & VEGETABLES



Here are demonstrated simple methods of laying out a flower and a kitchen garden. In the upper photograph, you see a good example of a small, simple rose garden, arranged around an ornamental bird-bath and with a formal, instead of a crazy, pavement. Beyond the rose-beds is a little lawn, edged by the herbaceous border. The lower picture shows you that the kitchen garden should also be neat and properly planned. The three main crops growing here are onions (on the left), celery (in the left hand trench), and lettuces. Loganberries are growing along the wires beyond the onion-bed. See, too, how neatly things are labelled, and that there are no bare patches of unoccupied ground in which weeds can breed.

Upper photo H & I Joel

of earth round the roots to protect them. The hole into which the new plant is to fit should be made much deeper and wider than is necessary to accommodate the plant, and the bottom should be covered with fertile top soil. Spread the roots into their natural positions, and then gradually work in rich and well pulverized soil about the plants and roots. Put in small quantities at a time and press each layer in firmly. In dry weather



#### MAKING A ROCK GARDEN

On the left is a quaint little rock garden, easily constructed by cementing a few old bricks together for support. Above is a more elaborate example laid out by placing blocks of stone in rough shallow terraces. Dainty rock plants like columbine, saxifrage, gentian, white rock cress, candytuft, aubrietia, and many others, cluster between the crevices.

*Photos left Humphrey & Vera Joel top "Amateur Gardening"*



particularly, and always with plants having big roots, it is better to wash the soil into position with copious waterings from a hose. Fertilizer must never come in contact with the roots, so do not mix it with the soil used in transplanting.

"Plant thick and thin quick" is good garden practice. Plant vegetable and flower seeds thickly enough to give the garden the ap-

pearance of being well covered. As the plants develop, never permit them to crowd one another. Pick out the superfluous plants so that each remaining individual will have plenty of room for full development.

Annuals will give the quickest returns in the flower-beds, and are essential for carrying colour and bloom in the garden in midsummer. But among the earliest and finest flowering plants are the hardy perennials, the permanent plants which should be a part of every garden. There are two general types of perennials: perennial shrubs with woody, tree-like stems, such as roses, and herb-like or herbaceous perennials in which the soft plant foliage springs directly from the roots. In the latter, the stems and leaves are killed by frost each autumn and are replaced by new growths each spring.

Herbaceous perennials are planted in the garden wherever they give the most pleasing effects. They may be planted with shrubs or intermingled with annuals in the flower bed. They are used very effectively to furnish a flower-border. Peony, iris, phlox, Michaelmas daisy, golden rod, anchusa, Japanese anemone, aquilegia (columbine), coreopsis, geum, day lily, lupin, and gaillardia are a few of the many reliable perennials that may be used in the herbaceous border. It is important to keep the grass edge by the border very neatly trimmed. Sometimes a narrowish edging of



## GARDENS

crazy paving is used for the low growing front plants to fall forward on, but these can easily be kept within bounds with string. Where space and the lie of the land permit, a double herbaceous border with an immaculately kept and edged grass path between is a very attractive feature.

The first step in beautifying the ground on which your house stands with flowers, shrubs and trees is to work out a complete and detailed plan. The purpose is to create a harmonious and beautiful setting for the house itself. Trees and shrubs should not hide the house, rather should they bring out its salient features and harmonize with its architecture.

### Designing a New Garden

The front and back lawns serve as the ground work of the garden picture. It is generally preferable not to cut up the centre of the lawn to make room for flower-beds or other ornamental planting. A well kept lawn is beautiful in itself. The house is not complete without some carefully placed plant masses round it to blend it with the landscape. Low-growing shrubs should be planted in front of porches and under windows. Taller-growing shrubs will give support to each end of the structure.

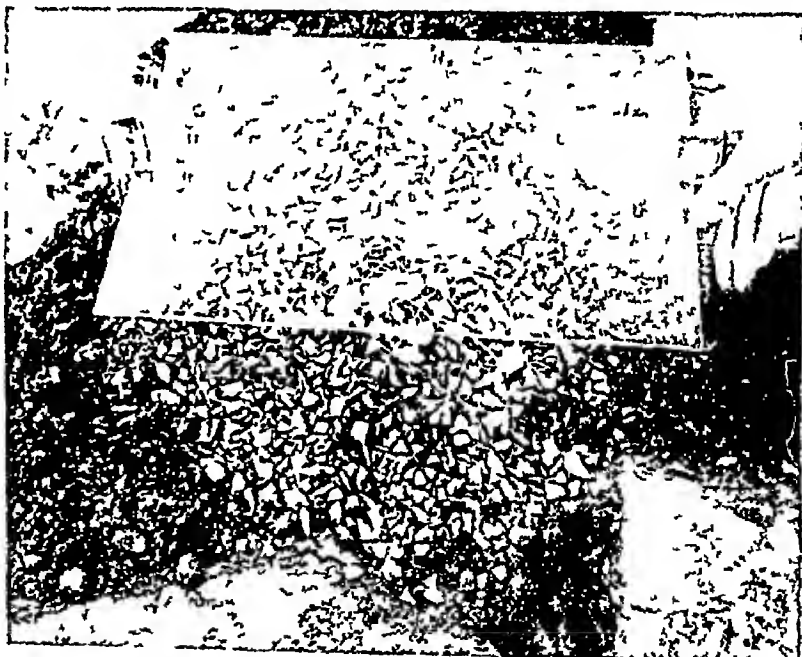
The service area should be convenient to the service quarters of the house, and preferably screened off by shrubs or other plants to add to the garden picture. The pleasure area should be designed in relation to the living quarters of the home. Draw imaginary vista lines from windows, doors, and porches to the most distant points of the available garden area, and keep these vistas free and open. Draw a rough plan of the area with the vista lines marked on it and showing any other permanent features, such as the garage. Also lay out any necessary walks. Roughly draw ovals in each of the more or less rectangular spaces thus formed. This will give you a working foundation for the plantings. The centres of these ovals should be kept unplanted or practically clear. Paths, which may be flagged, of crazy paving, brick or gravel, etc., should be straight wherever possible. The serpentine path, if introduced, should be justified at each bend by some interfering object, such as a tree or a flower bed, quite a short, irregularly winding path of crazy paving, with a herb-

aceous border on one side and merging into the lawn on the other, is very attractive. Since the garden and dwelling form a picture, modern taste justifies a permanent enclosure so as to give a frame to the entire composition. This enclosure may be a wall, fence or hedge.

The most lordly hedge material is yew, and next to that holly, but privet, arbor vitae, laurel, barberry, beech, hornbeam, lonicera, cupressus macrocarpa, or other shrubs that can stand clipping are equally suitable. Macrocarpa should be used only in a sheltered situation. Hedges should be planted in a deep trench well supplied with fertilizer. Each shrub should be planted such a depth that the final branching will extend right down to the ground level. Hedges are pruned slightly wider at the base than at the top so as to avoid snow damage.

The best time to seed a lawn is in late summer or early autumn, but it is commonly done in the spring. The soil of the lawn area needs the same preparation as the soil of the garden itself. When turning the soil, add commercial fertilizer. Roll the ground lightly after seeding.

Rock gardens, pools, bird-baths, sundials, statues, dove cotes, seats, and other special garden features must be introduced with care—a garden can easily be overcrowded. A combination pool and rock garden usually works out well. A rock garden should not be a mere pile of rocks adorned with a few flowers, but a close imitation of a natural rock outcrop carefully planted. It is best placed at one corner of the garden in a realistic setting. Use old weathered



### PROTECTION FOR TENDER ALPINE PLANTS

In spite of their name of 'alpines', many of the plants of the rockery need protection from the frosts of winter. Above is shown a good way of securing it. A sheet of glass is fixed above the plant by means of slotted wooden pegs keeping off the cold air, yet letting in the sun and light during the daytime.

## GARDENS

rocks, all of one kind. The stones should be laid horizontally, or, at all events, at such an angle as will afford the maximum amount of shade. In building a rock garden, make a mound of earth and then place the rocks in position on the mound, burying about two-thirds of the stone in the soil. Each rock should be used as a support for the soil, and should be slightly tilted so that the water will drain backwards to the roots of the plants. If a pool is used in combination with a rock garden, it should be informal. The concrete work should be carefully concealed with grasses and plants. The margins of the pool should be irregular and just as natural in appearance as possible. Plants adapted to a moist soil may be planted along the margins, and, in the pool itself, water lilies and other water plants. Trellises, arbours, and pergolas lend interest to the garden, but these should always be draped with some kind of climbing rose or other trailing plant.

Once the garden is planted, weeds, various insect pests, and fungus diseases demand attention. Stirring the surface soil with a hoe throughout the growing season will keep down the weeds. The soil should be cultivated only to



### THE ART OF PLANTING ROSES

For planting rose trees autumn is the best time. Spread the roots evenly in the hole and make it deep enough for the point at which stock and scion join to be about one inch below soil-level. After refilling the hole, tread the soil firm.

## GARIBALDI

the depth necessary to destroy the weeds, as deeper cultivation is likely to injure the roots of the plants.

Our battle with insect pests and fungus diseases should begin before these enemies swoop down on the garden. Fungus diseases, such as mildews and rusts, are controlled by sprays containing salts of copper, of which Bordeaux mixture is the best known. Caterpillars, beetles, and other insects that eat the foliage of the garden must be killed with the help of one of the excellent insecticides now marketed. The sucking insects—plant lice, or aphids (*q v*), leafhoppers, and the like—must be smothered by oils or dusts or killed with paralyzing contact poisons, such as nicotine. The borers tunnel through the branches and roots of trees and other plants, and must be hooked out with a wire.

### Insects that Help the Gardener

We should remember that not all insects are pests. Bees, butterflies, moths, and many others play their useful part in the pollination of flowers. Others, such as lady-birds, assist in the war against harmful insect pests by preying on them.

In order to thrive, the garden needs frequent watering throughout the growing season. Usually a thorough watering once a week, moistening the soil to a depth of at least four inches, is sufficient. Merely sprinkling the surface of the garden soil is worse than not watering the garden at all, for it causes the plant roots to reach for the water and come to the surface.

Winter protection of the trees, shrubs and perennial plants of the garden must not be neglected. A mulch of hay or straw over the perennial plants after the ground has been frozen will protect them. Partly rotted manure, hay, straw, or even ashes may be spread around trees and shrubs. The main purposes of a winter mulch are to prevent damage to the plant roots from alternate freezing and thawing, and to reduce evaporation of the moisture from the soil.

Among the multitudes of flowers grown in gardens, a few only have withstood the test of time. The unskilled gardener should not experiment with untried novelties. Annuals are most easily grown, but should be chosen definitely to fit the purpose. Most perennial flowers will thrive on moist soils, and should be selected carefully for the place they are to occupy, as they improve year by year until crowded, when they must be taken up, divided into smaller pieces, and replanted as at first.

**Garibaldi, GIUSEPPE (1807-82)** In spite of the old adage about the third time being lucky, it was the fourth attempt which brought Giuseppe Garibaldi, the knight errant of Italian unity, his signal success and enduring fame. Twice he joined in vain attempts to free Italy from Austrian rule: first in 1834 and again in



GARIBALDI AT CAPRERA

The island of Caprera was Garibaldi's home, and there he lies buried in his own garden. We see him here gazing out over the sea towards the Italian mainland, for whose unity he fought so gallantly.

*After a painting by Arthur Dixon*

1848—and each time he was forced to flee from the country. In 1834 he escaped to South America with a sentence of death hanging over him, and there he stayed for 14 years, taking part in the civil wars of Brazil and Uruguay.

Returning to Italy, he took part in the unsuccessful Revolution of 1848, and commanded the forces of the short-lived Roman Republic which he and Mazzini set up. When this collapsed, Garibaldi escaped in a wonderful retreat through central Italy, pursued by the troops of four countries. This time he sought refuge in New York, where he succeeded in accumulating a small fortune.

His third opportunity came in 1859, when Sardinia-Piedmont, with French aid, went to war with Austria. Garibaldi's Alpine infantry were victorious in the north, but further advance was checked by the peace made with the Austrians at Villafranca by the faint-hearted Napoleon III.

Secretly encouraged by Cavour, the great prime minister of Piedmont, Garibaldi and his "Thousand Redshirts" set forth in 1860 for Sicily, on one of the greatest filibustering expeditions in history, and one that eventually gave to his king, Victor Emmanuel, the remaining

half of Italy. Within a few short weeks after landing and assuming in the name of Victor Emmanuel the dictatorship of Sicily, Garibaldi had driven all the Neapolitan forces out of the island with little loss of life to his own men.

He had come into possession of money, arms, boats, stores of all kinds, had increased his army to some 25,000 men, and become the idol of all Sicily, to whom the red shirt of his warriors was the proudest badge of both men and women. So completely had he aroused Italy that each town poured forth its young and old to join his victorious standard.

#### Garibaldi Invades Italy

When Garibaldi crossed from Sicily to the mainland, in August, 1860, his march from Reggio to Naples resembled a triumphant procession. It was only necessary for Garibaldi to appear before a town for it to surrender. At one place, supported by a few hundred men, he ordered 12,000 Neapolitan troops to surrender, and they immediately did so, for his cause was really their cause. He entered Naples in the midst of enthusiastic crowds and handed the kingdom of Sicily and Naples over to Victor Emmanuel, whom he acknowledged as king.

Garibaldi himself, although he was the hero of Italy, was the most difficult problem that the new government of united Italy had to face. He never forgave Cavour for the cession of Nice—where Garibaldi, a fisherman's son, was born, July 4, 1807—to France as the indispensable price of Napoleon III's aid to Italian unity. Only with difficulty was he restrained from attacking Rome, although he knew that such an attack would bring against the struggling



WHERE THE PATRIOT SHELTERED

Here is the hut near Ravenna where Garibaldi sheltered in 1849 during his amazing retreat from the armies of France, Austria, Spain, and Naples.

kingdom of Italy the combined forces of France and Austria—one a friend, the other an enemy.

Twice the government was forced to send troops after Garibaldi and take him prisoner, in 1862 and 1867. When, finally, Italian troops entered Rome in 1870, Garibaldi had no part in it, for he was at that time helping France in its struggle against Germany.

When the Franco-Prussian war was over, he retired again to his island home of Caprera, where he spent the rest of his life receiving admiring visitors and attempting to stir up the people to establish a republic in Italy. He was easily worked on by unscrupulous agitators who sought the overthrow of the united monarchy he had helped to establish. Fortunately the plots did not succeed, and Garibaldi today is regarded as the hero of Italian unity. He died June 2, 1882.

**Gas.** The air we breathe, which is a mixture of nitrogen, oxygen, a little argon and carbon dioxide, and other impurities, is the most familiar example of a gas. Many gases are invisible, tasteless, and without smell, and can be detected only by their effects.

Gases have small densities as compared with liquids and solids, which is another way of saying that they are light in weight for the space they occupy. Water is 800 times denser than air, and air in turn is more than 14 times heavier than hydrogen.

Gases are indefinitely elastic, that is, they have no definite surface boundaries, but tend to expand indefinitely and occupy any space within which they may be confined. The molecules of which they are composed are supposed to be much farther apart than those of liquids or solids. These molecules are in ceaseless rapid motion, bounding and rebounding from each other like rubber balls. When they strike the walls of the vessel which contains them, they produce a constant stream of tiny blows on all parts of it, thus exerting a pressure which we utilize to drive our motor cars and to send bullets and shells flying from guns. This explanation of the action of gases is called the "kinetic theory" of gases. (See Explosives)

If two gases are brought together they will gradually mix with each other, even though the mixing has to be done in opposition to gravity, or through a thin membrane or piece of unglazed porcelain. Many gases dissolve in liquids. For example, ammonia and carbon dioxide readily dissolve in water. Air also dissolves in water to a certain degree. Thus it is that fish obtain the oxygen necessary for them.

The gaseous form of substances that are ordinarily liquid or solid, such as water, alcohol, and petrol, is usually spoken of as vapour. Strictly speaking, however, there is no physical difference between such a gas as oxygen, for instance, and water vapour. (See Air, Atom)



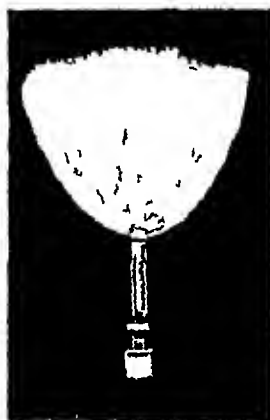
**GARIBALDI STRIKES A BLOW FOR UNITED ITALY**

Marching south after the Peace of Villafranca, bent on winning all Italy to unity, Garibaldi was hailed by the people of Sicily as their deliverer from the tyranny of their Bourbon sovereign. The Sicilians called him "saint and hero," "messenger of God," "beautiful as the seraphim", and even nuns ran to kiss him. In July, 1860, a desperate battle (shown above) took place at Milazzo, in which Garibaldi and his "red shirts" gained a hard-won victory against a force of 4,000.

# LIGHT and HEAT by TURNING a TAP

*Although electric lighting and heating are fast displacing the use of coal-gas for these purposes, there are still millions of gas users, many of whom prefer the older method. This article explains the origin and uses of "gas."*

**Gas Industry.** About 1792 William Murdoch, a Scottish engineer and colleague of James Watt, began the experiments which re-



The Gas Burner of Yesterday

sulted in the use of coal gas for lighting purposes. He heated coal in a kettle, and, by means of an iron tube, carried the resulting yellowish gas to a tank. When he had collected enough gas, he fitted over the end of the tube a silver thimble, in which he had bored a small hole. Lighting the gas that escaped through the hole in the thimble, he found he

had a good light to read by. He had a gas storage tank, a gas pipe, and a gas jet.

You can make gas just as William Murdoch did. Fill a clay pipe with coal dust, cover the top with clay or putty, then set the bowl of the pipe over a flame to get very hot. In a few minutes a yellowish smoke will issue from the stem. Apply a match to it, and it will burn, but not very clearly, for it is full of impurities. In gas plants these impurities are filtered out.

By 1802 Murdoch had succeeded in producing gas in sufficiently large quantities for lighting a foundry, and five years later his system was used for the lighting of streets in London. American scientists who heard of Murdoch's achievement followed his example. Today coal-gas is used to light our houses and streets, to cook our meals, and to furnish fuel and power for industry.

## How Gas is Produced

In the manufacture of gas great brick ovens, called retorts, are filled with coal, a large gas works may have a hundred furnaces or more, each heating from five to ten of these large retorts. The retorts are tightly closed, and the coal is roasted, producing coke (see Coke) and gas. This coal gas is a mixture of various substances, chiefly hydrogen, carbon monoxide, marsh gas (methane) and other hydrocarbons which burn readily. Nitrogen and carbon dioxide, which are non combustible, are also present, and the gas also contains many impurities, as ammonia, tar, sulphur compounds, etc.

To rid it of these, the gas is passed through water, where it loses some of its tar and ammonia, it is then condensed, and passed through the scrubber and washer to remove more tar

and ammonia. Formerly the tar was not used, but today it is an extremely valuable by-product (See Coal Tar). Finally the gas passes through layers of lime or oxide of iron to remove the sulphur, after which it goes into huge storage-tanks until it is used. These tanks are great iron cylinders, closed at the top and open at the bottom, resting in cisterns of water—the "gasometers" that make so familiar a part of every urban landscape. They rise and fall according to the volume of the gas, thus keeping a constant pressure.

The old-fashioned flat-tip burner was for many years the only method of using gas for lighting. Two discoveries completely changed lighting methods and provided a much better light with the use of less gas. One of these was the Bunsen burner, which mixes the gas with the air and thus produces complete combustion and much greater heat, with an almost colourless flame. The other was the incandescent mantle, discovered in 1886 by Dr. Carl Auer von Welsbach of Vienna. In the Welsbach system, the light comes from a "mantle" heated white hot by a mixture of gas and air as in the Bunsen burner.

## What Mantles are Made Of

The materials for these mantles come from opposite sides of the earth. Natives of India grow the China grass, whose fibre is needed for weaving the mantles, while in far off Brazil rare earths are mined containing the chemical elements thorium and cerium, with which the mantles are saturated (See Chemistry). After the vegetable fibre of the China grass has been burned away, a mineral "skeleton" of the fabric is left, which glows with a bright white light.

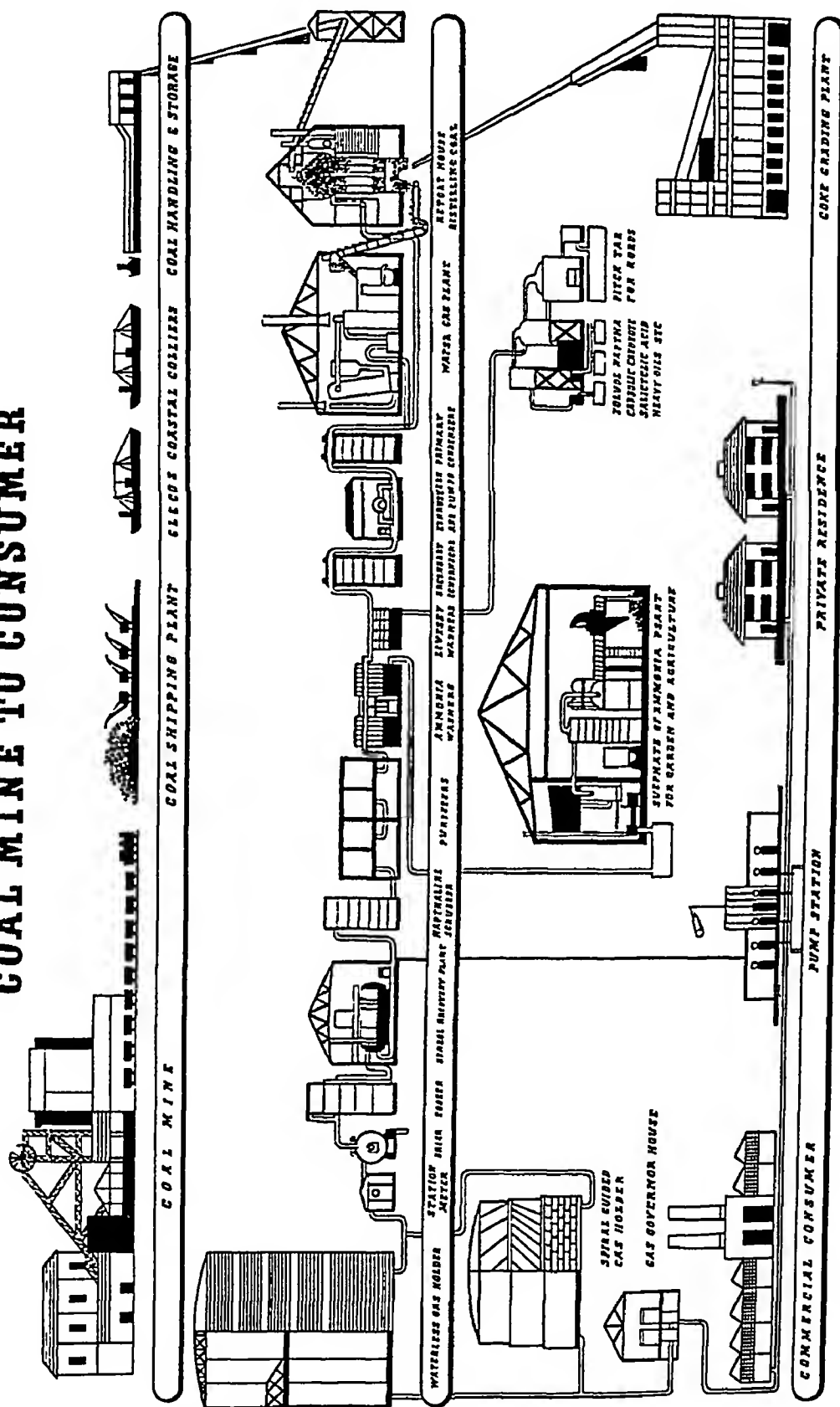
But, with the coming of electric lighting, the use of gas for illumination has become less important than its use as fuel. The gas stove has largely replaced the coal-range in the homes of town dwellers, its chief advantages being the ease with which the heat can be turned on and off, and its general cleanliness.

Gas is distributed from the manufacturing plant through "main" pipes. From these service pipes lead to the individual consumers, where meters measure the amount used. The pressure in the service pipes varies in different places from about 1 to 2 oz. per square inch. In places where the population is scattered over wide areas, the use of high pressure gas (from 10 to 20 lb. per square inch) has been largely advocated in recent years.

"Water gas," a mixture containing chiefly hydrogen and carbon monoxide, is made by

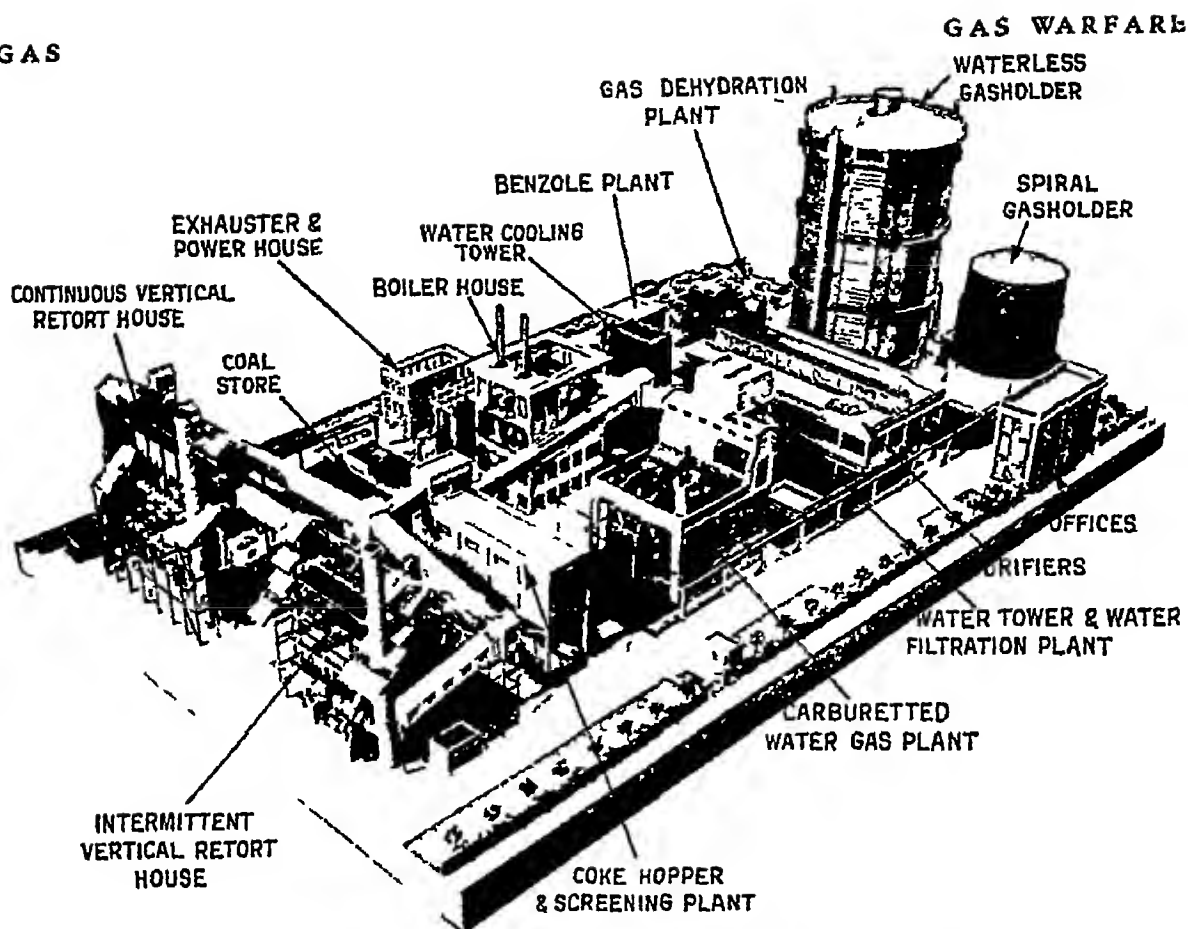


# COAL MINE TO CONSUMER



Before the gas which heats and lights our rooms and cooks our food reaches us it has gone through many processes since it was mined in the form of coal from the pits. This diagram shows the various stages of making and distributing gas and how the by products are obtained. The sale of these makes it possible to produce household gas at a low price.

Coal is a *Gr. Light & Co.*



### WHERE COAL-GAS FOR LIGHTING AND HEATING IS MADE

This photograph shows a model of an up to date gas plant similar to that which is seen in the middle of the diagram in page 1806, in connexion with which it should be studied.  
*Courtesy Gas Light & Coke Co*

passing steam through red hot coke or coal. The gas thus produced burns with a very hot blue flame, but it is extremely poisonous because of the high percentage of carbon monoxide it contains. To fit it for use as an illuminating gas, it is "carburetted," that is, mixed with gases which burn with a luminous flame, such as ethylene and acetylene. Another gas, highly useful in industrial processes, is "producer" gas. The best quality is made by passing air through white hot coke, although coal and even peat may be used. Blast-furnace gas, generated in the operation of blast-furnaces, is another fuel of this type. Acetylene ( $C_2H_2$ ) is a widely used gas where there are no central gas works.

For a long time natural gas, found in rock formations, was regarded merely as a curiosity. In China, Persia, and British India, where it issued from crevices, it was kept burning and worshipped by the natives as a fire god. Near Baku, on the Caspian Sea—one of the world's greatest oil centres—are the ruins of an old temple built on the site of one of these fiery jets.

The United States apparently has the greatest wealth of natural gas, but Canada also has considerable supplies. "Burning springs" were known in America as early as 1775, and the first discovery by drilling was made early in the 19th century.

In 1821 natural gas was used for lighting in Fredonia, New York, U S A, but it was not until 1872 that it was collected and piped on a commercial scale. The total amount used each year is now valued at £90,000,000—most gas coming from oil regions. Natural gas, the cheapest fuel known, has been a boon to many specialized industries, particularly in fine smelting and in the manufacture of gears, where a hot clean flame is required.

It is not a chemical compound, but a mixture of several compounds—combustible gases and vapours, chiefly methane. It is generally believed that it is produced by the decay of organic matter—especially vegetation deposited in by gone geological ages.

The wells vary in depth from 250 feet to more than 7,000 feet, and in diameter from 2 to 8 inches. The open flow varies from 500 to 35,000,000 cubic feet a day. A volume of 1,000,000 cubic feet per day is profitable.

**Gas Warfare.** When the Germans began to use chlorine gas at Ypres in 1915 (in direct violation of a regulation of The Hague Convention made in 1907) they introduced one of the most terrible of modern methods of warfare.

The gases used include the familiar irritating chlorine, di phenyl chloro arsine, a nasal and bronchial irritant, diphosgene (trichloro-methyl-



Hagstone and Fox

## GAS MASKS FOR YOUNGSTERS

Every modern resource is used to protect the civilian population from the terrors of gas attack. The top picture shows the headmaster of a council school inspecting the scholars gas-masks. Below is seen a baby being fitted with a gas helmet of special design, intended for the use of infants up to two years of age.

chloroformate), a tear compelling gas, or lachrymator, phosgene (carbonyl chloride), a gas so deadly that one part in 10,000 of air may be fatal, and others, some attacking the lungs and causing asphyxiation, some paralysing the nerves, some producing nausea and vomiting, thus compelling the soldier to remove his mask, and others—the deadliest of all—attacking, consuming, and burning all exposed tissues.

For protection against gas attacks, all soldiers in front line trenches were soon equipped with gas masks. These were of two chief types, either a bag worn over the head or a box slung on the chest, with nose piece and breathing tube attached. They contained either neutralizing chemicals or charcoal. The Treaty of Versailles assumed that the use of poison gases was contrary to international law, and the Washington Conference (1922) confirmed this rule. None the

less, gas bombing by aircraft is a terror which every country is preparing to face, and gas masks, or "respirators," are being made for the population of Britain under the Air Raid Precautions Department of the Home Office.

**Gelatine.** When you eat a quivering, brightly coloured, fruit flavoured jelly, you are making acquaintance with one of the many uses of gelatine. In the raw state, this hard, yellowish, semi transparent substance is obtained chiefly from animal tissues, especially bones, horns, and hoofs. When bones are soaked in weak acid, certain parts dissolve and leave behind the bone cartilage, and when this is boiled it dissolves and forms gelatine. Vegetable jelly, similar in many ways to gelatine, is manufactured from a seaweed known as Irish moss.

In its crude condition, gelatine is cut into slices, dried, and sold as glue. Gelatine is purified in various ways, purified with sulphurous acid, it is used for making the tough, whitish, semi transparent substance called "isinglass," valuable in refining liquors and stiffening food.

The best isinglass and edible gelatine is obtained from the air bladders of fish. It was formerly obtained solely from the sturgeon of Russia, but it is now procured also from the cod and certain other fish. (The name isinglass is often incorrectly applied to the mineral mica, which splits into thin sheets closely resembling the gelatine isinglass.)

Gelatine is one of the ingredients of printing press rollers. It is used as a coating or capsule for pills, and is employed in dyeing and tanning, in making paper, waterproofing material, India inks, artificial leather, and artificial silks. It also forms the base in which are embedded the sensitive chemicals used in coating photographic plates, films, and papers.

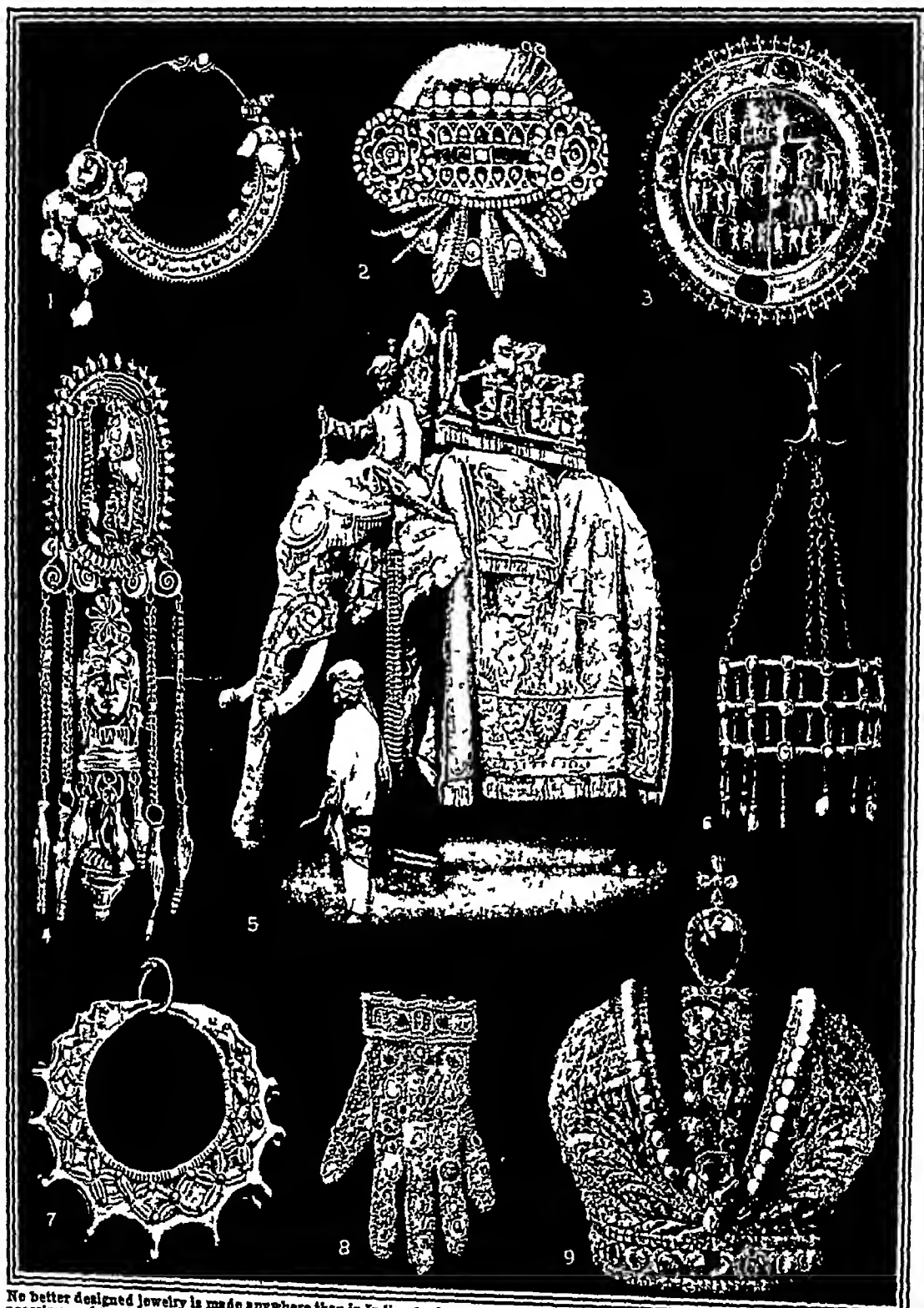
**Gems.** Precious stones have been valued highly in all lands and ages. They are ranked according to colour, lustre, hardness, durability, and rarity. The precious gems are diamonds, rubies, emeralds, and sapphires, the semi precious include topaz, spinel, opal, amethyst, moonstone, aquamarine, chrysoberyl, tourmaline, zircon, peridot, garnet, and others. Fashion as well as other considerations may affect the value of any of these ornaments.

The sparkling diamond, the "king of gems," which is pure crystallized carbon, is the hardest of the precious stones. (See Diamond.)

Rubies and sapphires rank next for hardness. The best rubies—which are usually a pure carmine red—come from Burma, Siam, and Ceylon. Pink, purple, and violet rubies are also found, those most valued are of the tint called "pigeon's blood."

Large rubies are very rare. Gustavus III of Sweden is said to have given one as big as a pigeon's egg to Catherine of Russia. One of the most famous rubies in the world is that which is

## SPLENDID JEWELS ENCRUSTED WITH GEMS



No better designed jewelry is made anywhere than in India. 1 A nose-ring, and 2 a brooch, are typical of Indian ornament. 3 This crystal medallion with its fine intaglio carving of the story of Susannah, was made for Lothair, king of the Franks, in the 9th century. Its mounting is 15th century. 4 Fine chains, scrolls, and figures adorn this Etruscan pendant, or earring, of the third century B.C. 5 A fine lady could not be more elaborately ornamented than this Bombay elephant, with his dangling earrings, gold tipped tusks, fancy head-gear, and gorgeous gold-embroidered robe. He even has two bracelets on one huge ankle.

6 Gothic kings of the 7th century wore crude, massive crowns like this one from the 8th found at Guarrazar, Spain, now in the Cluny Museum, Paris. The chains were added when the crowns were suspended in a church as a votive offering and used to hold a lamp. 7 From the ancient, mysterious city of Mycenae in Greece, which thrived some 15 centuries B.C., comes this earring or pendant. 8 Gold, gems, and enamelled plates rather overdo the elegance of the gloves worn at the coronation of an emperor of the old Holy Roman Empire. 9 The imperial crown of Russia is said to be made up of flawless, perfectly matched stones.

set in the front of the crown with which King George VI was crowned in 1937. It is said to have been given by Don Pedro of Spain to the Black Prince, who wore it in battle, as did Henry V at Agincourt and Richard III at Bosworth field. It is 2 in long and 1½ in broad. The so-called rubies found in South Africa, Australia, and the western United States are a fine variety of garnet.

The pretty, bright blue sapphires are valued for quality rather than size.

Flawless emeralds are rarely found. Some specimens are of great size, one found in the Ural Mountains weighing 6½ lb.

The trade in gems, cut and uncut, both mounted and unmounted, is enormous.

Gem cutting and engraving—the lapidary's art—has been practised from very remote times. Great numbers of precious and semi-precious stones have been found in Mesopotamia cut into cylindrical form and bearing engraved figures. When rolled over the soft clay of writing tablets, these cylinders left the design in relief to serve as a personal seal. Thus art had been

developed to a high degree of perfection by the ancient Sumerians at least as early as 3000 B.C. Seals engraved with the sacred beetle, called scarabs, were in use in Egypt in the same period.

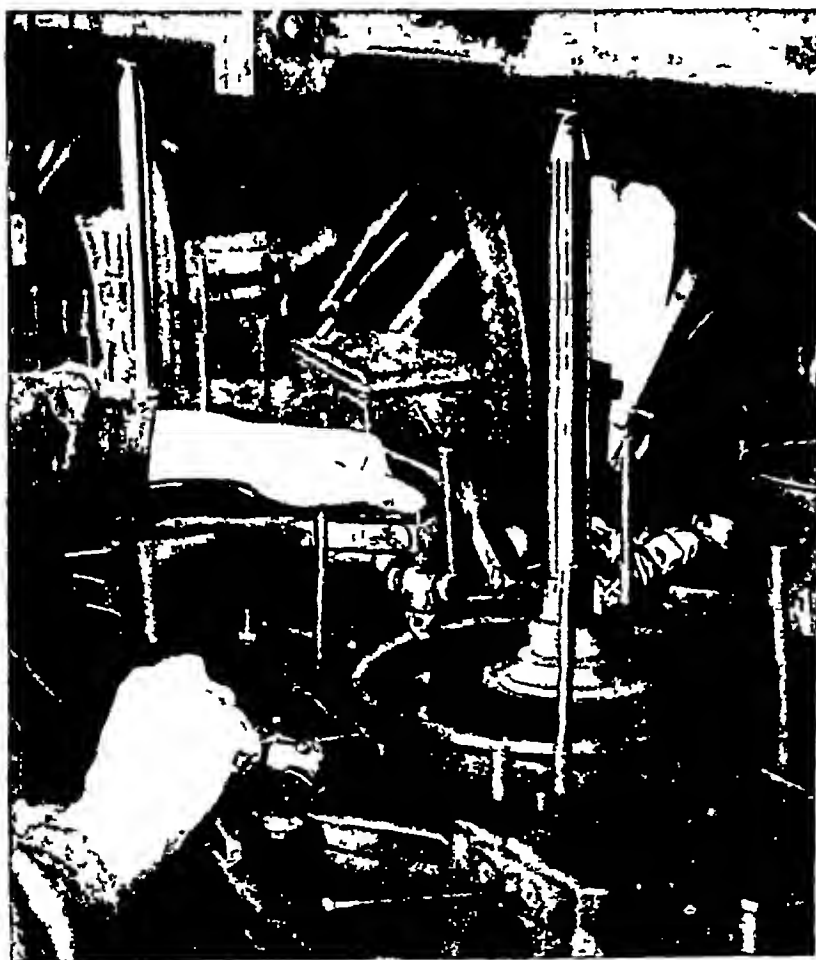
Certain imitation precious stones can be made in the chemist's laboratory. Some of the synthetic rubies and sapphires made today can be told from the real stones only by experts. Artificial rubies are built up by allowing molten drops of a chromium aluminium oxide mixture, fused in a flame of illuminating gas and oxygen, to fall on a support and form a red pear-shaped mass, or *boule*, which is cut into gems when cool. Artificial sapphires are made by adding oxides of iron and titanium, as pigment, to aluminium oxide. About 20,000,000 carats of these rubies and 12,000,000 carats of sapphires are marketed yearly, mostly for use in watches and scientific instruments.

These synthetic stones are distinguished from the natural ones in three ways. Man-made stones are composed of curved layers, natural stones of flat layers. Air bubbles frequently occur in synthetic stones, rarely in the natural. Synthetic stones, when exposed to cathode rays, are said to continue glowing after the rays are switched off, whereas natural stones stop glowing.

The making of imitation gems, as distinguished from synthetic stones, is an ancient art. The usual basis is a hard, brilliant glass, called paste or strass, with a high percentage of oxide of lead. False diamonds are cut from the pure paste, while colour is added for imitation sapphires, amethysts, etc. These mock gems are never as hard or brilliant as real ones. "Doublets" are made by mounting a thin front layer of real stone on a paste back. The colour of genuine gems is often improved by staining, or by treating them with heat or radium. Opals are frequently heated in a bath of oil.

### Geneva, SWITZERLAND

"A bird's nest of a place, the most lovely spot and the most notable, without any possible dispute, of the European universe." This is what the great art critic Ruskin said of Geneva. The town nestles in a cup of the Alps at the lower end of famous Lake Geneva (*Lac Leman*),



GEM CUTTER AT WORK

Wide World

The cutter sits at a lathe which can revolve at terrific speed and carries a narrow disk coated with diamond dust and oil. The gem is fixed in a cup-like grip (see picture), and in this way its rough edges are pared away—perhaps even to half its mass—in order to bring out the beauty of its light and colour.



## GENEVA



Dorten Lelah

### GENEVA BESIDE THE PLACID WATERS OF ITS LAKE

Geneva stands on the south-west extremity of the Lake of Geneva near the confluence of the Arve with the Rhône. Although the city dates back to Roman times it has few public buildings of importance. The city is here seen from the suburb of Cologny, looking towards the confluence of the Rhône crossed by the Pont de Mont Blanc. Just above the bridge on the left is the tower of the Cathedral. In recent years Geneva has gained new fame as the seat of the League of Nations.

whence the river Rhone issues as clear and blue and shimmering as a butterfly's wing.

Sweeping under its white bridges, the river forms two islands, one of which is called the island of Jean-Jacques Rousseau, after the great revolutionary writer, who was one of Geneva's many famous sons. The town is as clean and shining as the river, with broad promenades by the lake, and streets of handsome white stone houses. And when, at sunset, the snow clad peak of Mont Blanc, 40 miles to the south east, becomes visible among its lesser sisters in delicate rose and white and lavender, the spectacle is one of almost unearthly beauty.

Lying nearly in the centre of Europe, and one of the gateways to Switzerland—"the world's playground"—Geneva has long been a favoured resort for travellers. Its beauty, its ancient traditions of culture, have induced many citizens of other lands to make it their permanent home.

The city is the home of the League of Nations, and to many the *Palais des Nations*, where the League meets, is the soul of Geneva. (See League of Nations.) The city is also the headquarters of at least 40 other international organizations, including the International Red Cross, International Labour Office, the Students'

International Union, the Geneva School for International Studies, the Interparliamentary Union, International Peace Bureau, and International League of Economic Entente.

Long before the formation of the League of Nations Geneva was a centre for international meetings. The International Red Cross was established here in 1863-64, and in 1871-72 the Alabama claims case between the United States and Great Britain, arising out of the Civil War, was here the subject of arbitration.

During the Reformation Geneva was known as the "Rome of Protestantism." John Calvin had his headquarters here from 1536 until his death. Calvin practically ruled the city, and gathered about him many other Protestant reformers. (See Calvin, John.) In 1559 Calvin founded an academy, which became part of the University of Geneva in 1873. Voltaire lived for years at near by Ferney, and when Napoleon rose to power his bitter enemy, Madame de Staël, established her famous *salon* in a chateau on the north side of the lake, at Coppet. Her chateau attracts many visitors. Broad, tree lined promenades and luxurious tourist hotels surround the lake in Geneva, and handsome homes face its clean streets. The city has

## GENEVA

beautiful university buildings, and magnificent palaces house the international organizations. The old walls, pulled down in 1848, are recalled by the Promenade des Bastions which leads out of the Place Neuve, the finest square in Geneva. John Calvin preached from the pulpit of the cathedral of St Peter, a fine Gothic structure rebuilt in the 12th century.

Geneva is French in language and in customs, for it is almost completely surrounded by France, only a narrow strip connecting it with the rest of Switzerland. Its principal manufactures are watches, scientific instruments, jewelry, machinery, and chocolate.

In the days of the Roman Empire Geneva was already a city. At the close of the Middle Ages the citizens freed themselves from the feudal control both of their bishop and of the neighbouring house of Savoy, and established a self-governing republic.

The most celebrated event in the city's history was the repulse of a surprise attack on Geneva in 1602 by the house of Savoy. In memory of the event the Genevaise still hold a festival every year. Napoleon annexed Geneva to France in 1798, but in 1815 the city regained its freedom. The population of Geneva is about 146,000.

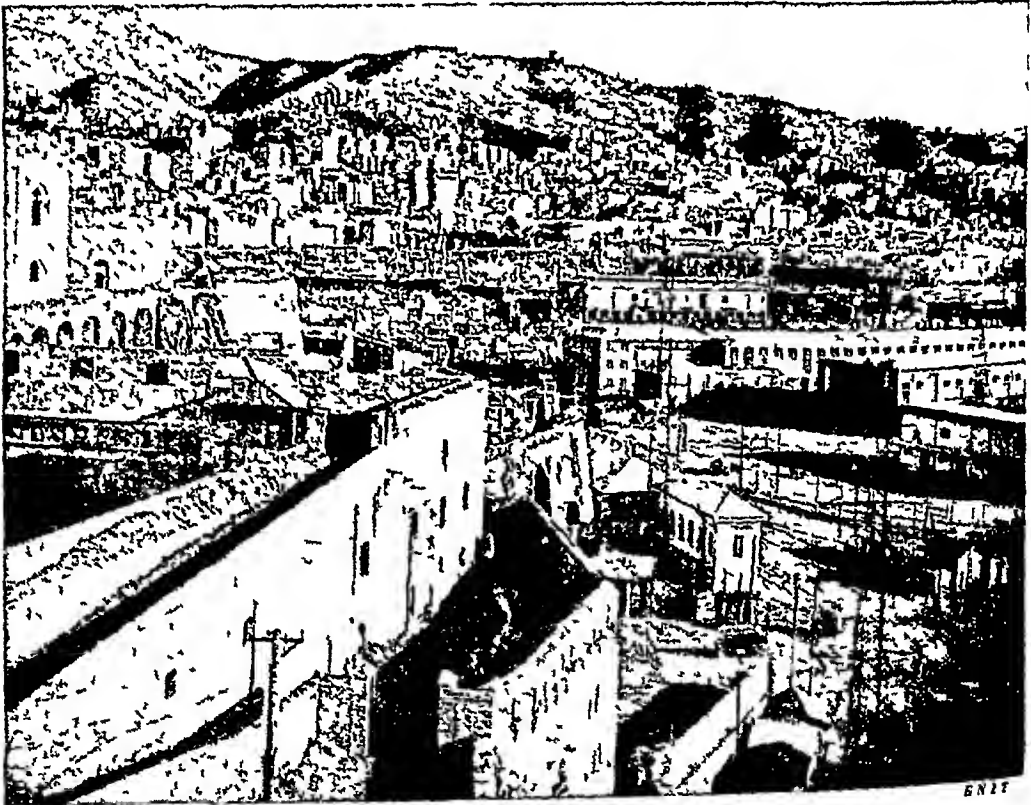
## GENOA

Beautiful Lake Geneva, 45 miles long, is the largest lake in Switzerland. At the opposite end to the city of Geneva, near Montreux, is the Castle of Chillon, made famous by Byron's poem, "The Prisoner of Chillon."

**Genoa, ITALY** Since early historical times Genoa "the Superb," rising from the Gulf of Genoa in beautiful relief against the sharp slopes of the Apennines, has been one of the most important seaports on the Mediterranean and a gateway to northern Italy. From its great harbour hundreds of noted sea captains have set sail on romantic adventures of conquest and commerce in distant lands, making it a fitting birthplace for its most famous son, Christopher Columbus.

Genoa is by far the largest port in Italy, and handles one-fifth of the nation's tonnage. It bids fair to be the largest port on the Mediterranean, and now outstrips its nearest rival, Marseilles, in the tonnage of goods handled, though not in number of ships.

The docks and warehouses of the already splendid harbour are being enlarged to receive the cargoes of coal, wheat, maize, cotton, mineral oil, phosphates, iron and steel, timber, and chilled meats which Italy imports. The exports



**THE GREAT PORT OF GENOA SEEN FROM THE HARBOUR**

This general view of the town of Genoa shows its peculiar configuration near the harbour. It stretches inland, from the confined level ground along the shore, over the lower hills of the Ligurian Alps, and many of the narrow, winding streets of the old quarter are, in consequence, quite inaccessible to traffic. The modern quarter has broad, straight thoroughfares and numerous fine parks and squares. From the hills splendid views can be obtained of Genoa's magnificent buildings.

include silks, olive oil, wine, soap, marble, and paper. The city is the hub of Italy's air lines, and the junction point for rail transportation to the north.

After passing through the hands of the Lombards and the Franks, Genoa became an independent city upon the break-up of Charlemagne's empire. The aristocratic and the democratic factions were in constant turmoil up to the 16th century, when the autocratic rule of the doges began. Self government continued until the days of Napoleon, after whose fall the city passed to Sardinia Piedmont, and became a part of the kingdom of Italy with the union of the peninsula under the Piedmontese kings. The population of Genoa is about 325,000.

**Gentian.** (Pron jen' shun) Long, long ago, so it is said, Gentius, king of ancient Illyria, discovered that a medicine could be produced from the root of this lovely plant, and thus it got its name.

The gentians are hardy plants found in many parts of the world, in both warm and cold regions. They do so well in the Alps as to cover some slopes with sheets of their blue flowers. Parts of the plant are employed in the preparation of tonics, *Gentiana lutea* being the species of chief medicinal value. Other Alpine species



BRITAIN'S LOVELIEST GENTIAN

These are the flowers of the beautiful marsh gentian, a species found on wet heaths and moors in the south of England, though nowhere very common. Its flowers are usually a brilliant blue, with darker spots deep down inside the funnel-shaped corolla.

are very popular for planting rock gardens. Almost all gentians are blue or purple, but a few rare species are white, yellow, or red, the last being found in the Andes. In Britain, two small, purplish species are found on the chalk and limestone hills, but the finest is *G. pneumonanthe*, the marsh gentian.

## LANDS & PEOPLES of the WIDE WORLD

*H*iding under the dull name of "geography" are all kinds of thrilling stories and colourful pictures of distant lands, their cities and races—and interesting explanations, too, of the "whys" and "wherefores" of the world as it is.

**Geography.** In the hot and very damp island of Borneo are the savage Dyaks, who live in houses set on piles along the rivers,



hunting game with spear and blow-gun, and planting crops of rice and vegetables. Up in Arctic Labrador the sturdy, squat Eskimos dwell amid snow and ice, getting their food and clothing from the animals of sea and land. The patient Chinese, bent with toil, works day and night in his little terraced rice field, up to his knees in water, using his bare feet to

pack the mud round the young rice plants and to pluck up the harmful weeds.

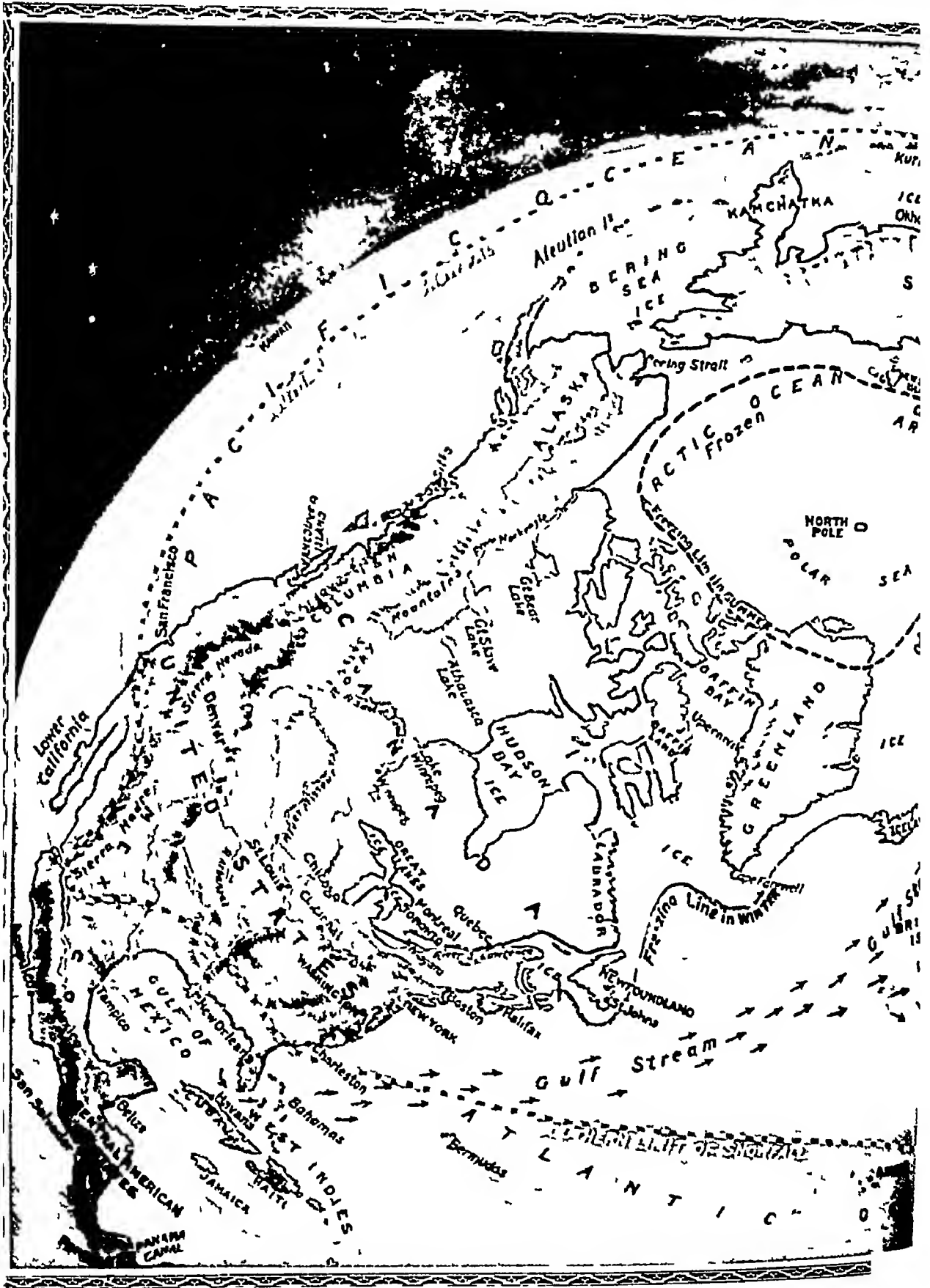
Along the Nile the Egyptian fellah laboriously lifts the water of the river by *shadoofs*

into the channels that water his field. On the vast prairies of North America farmers drive great gang ploughs drawn by six, eight, or ten horses or by mechanical tractors, producing enormous crops of grain to feed the hungry world. On the immense treeless steppes of Central Asia, where there are no mild ocean breezes to temper the cold of winter and the extreme heat of summer, the Kirghiz and Mongols pasture their flocks and herds.

In the sweltering, fever-ridden jungles of the Amazon, naked savages, too low in civilization to have learned to plant crops, live on the fruits and nuts of the trees, the fish of the rivers, and the animals they slay, while only a short distance to the west, still near the Equator, the mountain shepherds of Bolivia dwell on the lofty heights of the Andes, where it is so cold that only the hardest crops will grow, and men would perish but for the food and clothing they get from their flocks of llamas.

Why do the peoples of the world differ so widely in the way they live, in dress, appearance,

‘THE WORLD AND THEY THAT DWELL THERE



# S THE SUM & SUBSTANCE OF GEOGRAPHY



Thinking of the earth as the home of Man and Geography as the science that deals with it as such, what a magnificent subject for investigation and reflection this view of the globe provides us! Here we have the theatre on which almost the entire drama of the world's history has been enacted

Beginning with the cold and barren region in which the Eskimos, the Lapps, and other Arctic peoples have made such difficult progress, and have overcome the obstacles of climate and situation in so many ingenious ways, we pass down through the temperate regions where the civilization of today has reached its highest point Further down we reach lands with climates so mild and friendly that fewer obstacles were offered to Man's progress Here the oldest civilizations grew up, the civilizations of Egypt, Babylonia, Greece, and Rome

In imagination we can people this map with the Siberian hunters in their land of snow and ice, with the prosperous farmers busy at their great harvest on the prairies of North America, with the patient Chinamen toiling in their terraced rice fields, with the Egyptian "fel lahin" patiently lifting the Nile water with their long shadoofs and with the wandering Mongols driving their flocks and herds over the immense steppes of Central Asia With this picture before us, we can reflect "how land and ocean, rivers and mountains, plains and valleys, temperature and wind and rainfall control the ways in which men live"



## GEOGRAPHY

customs, intelligence? The fascinating science of geography tells you, for it is the study of the earth as the home of Man. It shows how land and ocean, rivers and mountains, plains and valleys, temperature and wind and rainfall, in large measure control the ways in which men live, and the degree of civilization they attain.

Here and there men have come together into great cities, each with an individuality of its own and each crowded with interest. London, Paris, Istanbul, Peking, Cairo, Cape Town, New York, Quebec, Bombay, Sydney, Buenos Aires—every name is a flash of romance and mystery. Why did these great cities spring up at just those spots? Geography tells you. It shows how some, like Sydney and New York, owe their existence chiefly to their excellent harbours, how others grew up where the abundance of water-power was favourable to the growth of manufactures. Some have come to greatness because they stand at strategic points on great trade routes, while others, like Sheffield and Pittsburg, have been made by the proximity of great iron and coal deposits.

And so one might go on for pages, merely suggesting some of the myriad interesting things the study of geography has to tell us about the earth as the home of Man. But this, while the most absorbing and important of the aspects of geography, is only a part of the story. As its name shows, geography (from the Greek words meaning "earth" and "to write") is a description of the earth. Its vast subject-matter naturally falls into several main divisions, which are variously classified. The simplest division is into mathematical geography, physical geography, and biogeography or the geography of living things.

### Geography and 'Maths'

Mathematical geography treats of the form, size, and movements of the earth from the standpoint of mathematics. The consideration of these movements of the earth and their place in the solar system is closely connected with astronomy. And since it also has to do with the measurement of the earth and the various methods of representing its surface on maps, it is related to surveying and map making.

Physical geography, which is practically identical with physiography, as the term is commonly used, treats of the physical features of the earth—land, sea, and atmosphere. Geology, oceanology, climatology, and meteorology all contribute to this department.

Finally comes the great department which treats of the living things that dwell on the earth, their distribution and life conditions, culminating in the geography of Man. Man is the animal that has learned to conquer and control geographical conditions. By great engineering works he alters the earth's surface to his

advantage. He drains and irrigates the land, tunnels through mountains, reclaims land from the sea, and even severs continents by canals.

All other branches of geographical study rank lower than this crowning department and focus on it. Hence human geography, as it is sometimes called, is further divided into various subdivisions, such as political geography, which deals chiefly with the distribution of the human race, and economic or commercial geography, which treats of the manufacture and distribution of the world's products.

### The First Geography Teachers

The progress of geographical knowledge has depended largely on the progress of discovery. The Phoenicians were the first people who communicated to other nations a knowledge of distant lands. Their voyages, before the time of Homer, through the Euxine (Black Sea), the Mediterranean, and even into the Atlantic, form the first link of the great chain of discovery which, centuries later, was extended by Columbus to the shores of America, and by Da Gama to India. Travellers like the Greek historian Herodotus did much for the advancement of geography, as did also the exploring and surveying expeditions of Alexander the Great. At the same time Pytheas, the Greek navigator, was following the path of discovery in the north, possibly as far as Iceland, and in 276 B.C. Eratosthenes first used parallels of longitude and latitude and made real maps.

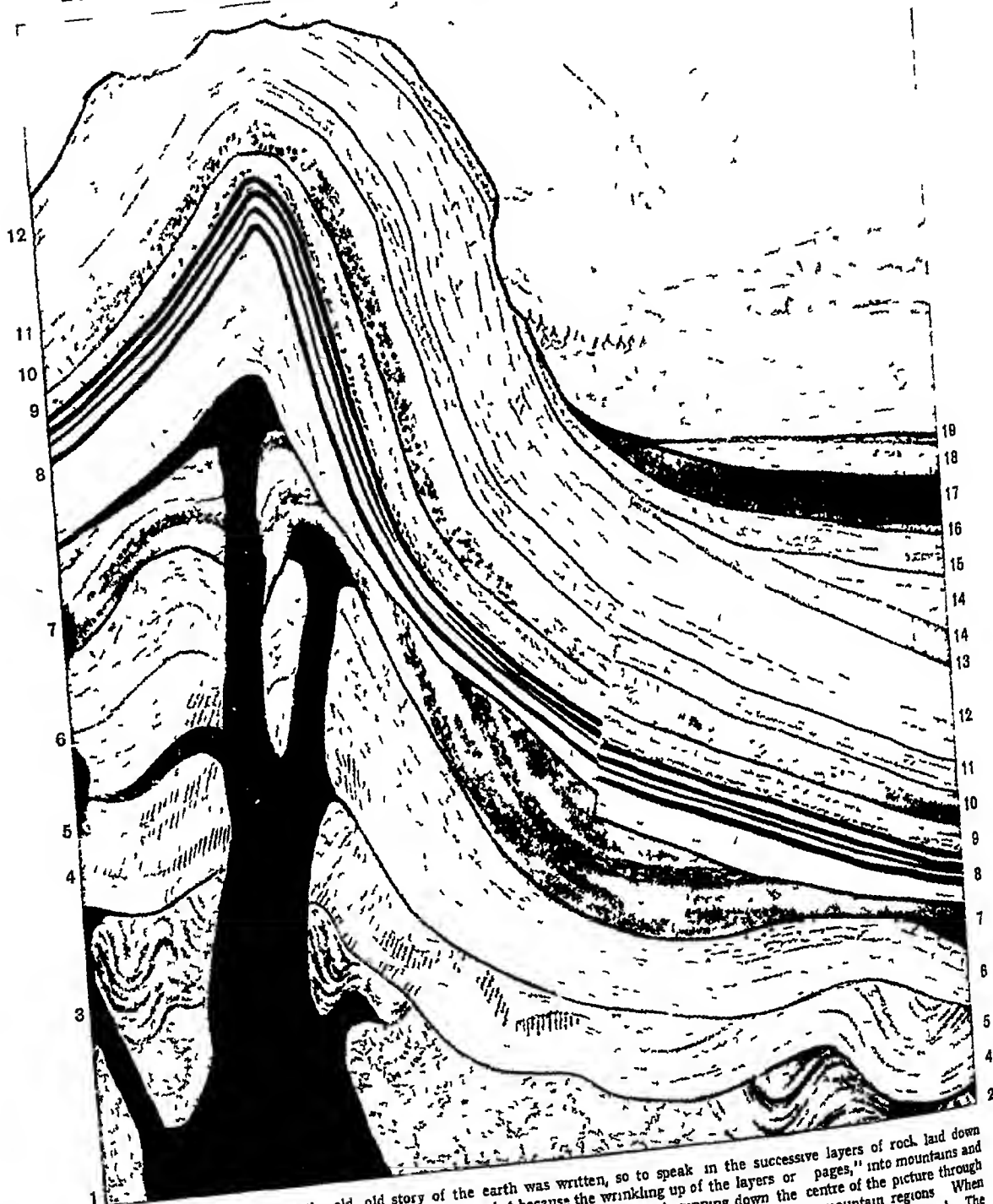
By this time the old idea of the earth as a flat circular shield surrounded by a rim of water had given place to the belief in a spherical earth, revolving, with the surrounding atmosphere, on one axis. The practical genius of the Romans led them to make a study of the resources of the countries they conquered, which did much for geography. Their greatest work was a survey of the whole empire, including a description and measurement of each province, which was made under Caesar Augustus. In the 2nd century of our era Ptolemy wrote a work on geography occupying eight volumes, and thus remained the great authority for many centuries.

### Exploring the East and West

The travels of the Venetian, Marco Polo, in the 14th century opened new fields of inquiry, and the close of the next century was marked by the discovery of the American continent. Within 30 years the whole coast of America, from Greenland to Cape Horn, had been explored, the Pacific Ocean had been navigated, and the world had been sailed round by Magellan, the coasts of eastern Africa, Arabia, Persia, and India had been visited, and numerous islands in the Indian Ocean discovered. The attempts to find a north-west passage to India increased the knowledge of the Arctic regions. In the 17th century the Dutch made known to the world



# THE EARTH'S STORY RECORDED IN THE ROCKS



This picture illustrates how the old old story of the earth was written, so to speak in the successive layers of rock laid down age after age, and how geologists have been able to read it because the wrinkling up of the layers or "pages," into mountains and their wearing down by wind and weather have brought them to light. The crack running down the centre of the picture through the upper layers is called a fault, such a break, if it develops suddenly, causes earthquakes in mountain regions. When reading this story in stone you should begin at the beginning which is at the bottom, where the first layers were formed. The oldest formation (1), consisting of gneiss granite and schist is called Archaean. Next (2) come the Torridonian and Laurenian rocks of Pre-Cambrian times. The dark green vertical formation (3) is 'trap rock' formed by molten stone that has welled up from below. The others in order are Cambrian (4), Ordovician (5), Silurian (6), Devonian (7), Carboniferous (8), Permian (9), Triassic (10), Liassic (11) and Oolitic limestone (12), both belonging to the Jurassic, Lower Cretaceous (13), Cretaceous (14), Eocene (15), when mammals appear, Oligocene (16), Miocene (17), Pliocene (18), when Man appears, and Pleistocene (19).

To face page 1817

the Australian Islands (which the Portuguese had discovered a few years before) Captain Cook in his three voyages completed our knowledge of most of the Pacific lands

At the beginning of the 19th century explorers were familiar with the outline of the continents and most of the islands, but four fifths of the land area was still practically unknown. There was only the scantiest knowledge of central and eastern Asia, and of the interior of the Americas. Africa was still truly the "Dark Continent." Most of the Polar lands were still undiscovered, and the existence of the vast Antarctic Continent was regarded as a fable.

#### Explorers who made Geography

By the close of the century most of these immense gaps in geographical knowledge had been closed by the labours of such heroic explorers as Lewis and Clark, Fremont, Pike, and Selkirk in North America, Parry, Franklin, the two Rosses, McClure, Kane, Nansen, Peary, and a score of others in the Polar regions, Livingstone, Mungo Park, Stanley, Burton, Speke, and Schweinfurth in Africa, Younghusband and Sven Hedin in Asia. But it was not until our own century that the veil was torn from the two chief objects of exploration—the North Pole, reached by Peary in 1909, and the South Pole, reached by Amundsen in 1911, by Scott

a month later, and by others more recently (See Exploration)

The work of geographers is still going on today. There are vast tracts, notably in northern Asia, Africa, South America, Arabia, and northern Canada, of which we have only scanty knowledge. There is also much to be done in the study of the ocean and the atmosphere. Aerial photography has been a great aid in exploring difficult regions, such as the densely forested areas of South and Central America and the icy mountains of Alaska. Aerial observers can map accurately in a few hours a stretch of territory which could otherwise be covered only by difficult and dangerous journeys lasting many weeks or months.

Geographical societies and associations have performed an important part in securing and spreading geographical knowledge. The first of these was founded in Paris in 1821. The Royal Geographical Society of Great Britain was founded in 1830, and the American Geographical Society in 1852.

Frequently members of these associations undertake distant travels, sometimes at their own expense, sometimes aided by funds from the society or the government. The information collected is given to the world in lectures, books, and periodicals.

## READING *the* STORY of *the* ROCKS

*Have you ever considered the difference between granite and clay, or wondered why the countryside changes its appearance from valley to high hills as you journey through it? Geology tells the answers to such questions.*

**Geology.** Everything which throws light on the history of the earth falls within the field of geology. The history of the atmosphere



A Fossilized Fern.

and the history of the ocean are really parts of geology, since they are intimately bound up with the story of the earth. The popular impression, therefore, that geology has to do only with the rocks of the earth is not altogether adequate. The rocks of the earth, to be sure, furnish the larger part of the data for unravelling the history of the earth, though they

are not the only sources of information.

The history of the earth has been largely worked out through the study of the changes which are now taking place on its surface. Rain falls on the land, and some of it gathers into streams, and the streams flow into the sea. In the flow of the water and by the action of the

atmosphere, the substance of the land is worn away, carried to the sea, and deposited there in the form of gravel, sand, mud, etc. The sand and mud need nothing but binding together to become sandstone and shale, two of the commonest sorts of rocks found on the land.

#### The Making of Rocks Continues

This process of building and destruction is now going on by natural means all over the world. In the sand and the mud, as they are deposited in the sea, shells and other parts of various animals and plants are embedded. The shale and sandstone of the land also contain shells and other traces preserved as fossils (See Fossils). Hence it is inferred that the sandstone and shale, as well as certain other sorts of rock found in the land, were originally deposited as beds of sand and mud in the sea, and that they have since been elevated, either by volcanic action or by the subsidence of surrounding land, so as to become dry land.

The activities of other surface agencies are studied similarly. The work now being done by volcanoes and earthquakes, by rain and rivers, underground water, waves and currents, the atmosphere, glaciers, changes of temperature,

## GEOLOGY

gravity, organic agencies, and all other forces and activities operative on the surface of the earth, has shown geologists how the rocks were formed in ages long past. It is by the explanation of the recorded results of the past, in the light of the processes now taking place, that the science of geology has grown up.

Geology really begins with the origin and earliest ages of the earth's history, which are as yet speculative. But while these first stages of the earth's history are largely guess work, many lines of investigation are being pursued which may ultimately provide much valuable information about them.

### Principal Kinds of Rocks

The rocks of the earth are, geologically speaking, of three great classes: (1) igneous rocks, those which represent solidified lava, or are otherwise of volcanic origin; (2) sedimentary rocks, as limestone, shale, sandstone, conglomerate, etc., most of which are made up of fragments of older rocks, or of animal and vegetable remains, usually deposited in the sea, in lakes or river beds; and (3) metamorphic rocks, which have usually been so far altered by various means that they are now very unlike the materials from which they were first made. In the metamorphism of rocks, pressure is the most important agent. Chemical change, under the influence of moisture, is probably second in importance, and heat third. The sedimentary series are the rocks containing the vast majority of fossils.

### Geological Eras and Periods

The time since rocks have been laid down is divided into four eras, and most of these are divided into several periods, as shown in the following table:

ERAS	PERIODS
CAINOZOIC	{ Quaternary (Pleistocene and Recently)
	{ Pliocene }
	{ Miocene } Tertiary
	{ Oligocene }
	{ Eocene }
MESOZOIC	{ Upper Cretaceous }
	{ Lower Cretaceous }
	{ Jurassic }
	{ Triassic }
PALAEOZOIC	{ Permian }
	{ Carboniferous }
	{ Devonian }
	{ Silurian (= Upper Silurian) }
	{ Ordovician (= Lower Silurian) }
PRE CAMBRIAN	{ Cambrian }
	{ Torridonian }
	{ Lewisian }

The Pre Cambrian era, which in America is classified quite differently—usually as Archaean or Proterozoic—contains in Britain rocks of two main types, the Lewisian being crystalline, the Torridonian, sedimentary.

Traces of fossils have been found in the later Pre Cambrian rocks, some in the shape of tracks

left by worms creeping through or over the mud, but few are definite enough to show what these earliest recorded creatures looked like. Yet these formations are many thousands of feet in thickness, and it is considered by qualified experts that the Pre-Cambrian era was possibly as long as all the succeeding eras combined. And that forms of life must not only have existed, but have been developing for a very, very long time indeed is shown by the fact that, even in the earliest rocks of the next era, many forms are already remarkably complex and must have undergone development through an unimaginably long period.

This next era, the Palaeozoic (or Primary) era, contains systems of rocks known as the Cambrian, Ordovician, Silurian, Devonian, Carboniferous, and Permian, deposited in that order.

### How Sedimentary Rocks Were Formed

These systems of rocks are mainly of sedimentary origin, and the materials of which they are composed were derived from the land areas existing when these systems were being laid down. Most of the materials of the systems were washed down from the land to the rivers or the sea, and there deposited. The several systems of Palaeozoic rocks are distinguished from one another by their fossils, each group showing development in successive eras.

Even at the beginning of the Cambrian period the range of life was large, all the great types which now live (except the vertebrates) being represented, and this shows that a wide gap, or "unconformity," exists between these and Pre Cambrian rocks. In this period trilobites and brachiopods seem to have been the most abundant and characteristic larger forms of life. Towards the end of the Ordovician system remains have been found which show the earliest fish-like forms. Molluscs, sea lilies, and corals lived in great profusion, in addition to all the types of life which already predominated in the earlier Cambrian period.

### The 'Devonian' Age of Fishes

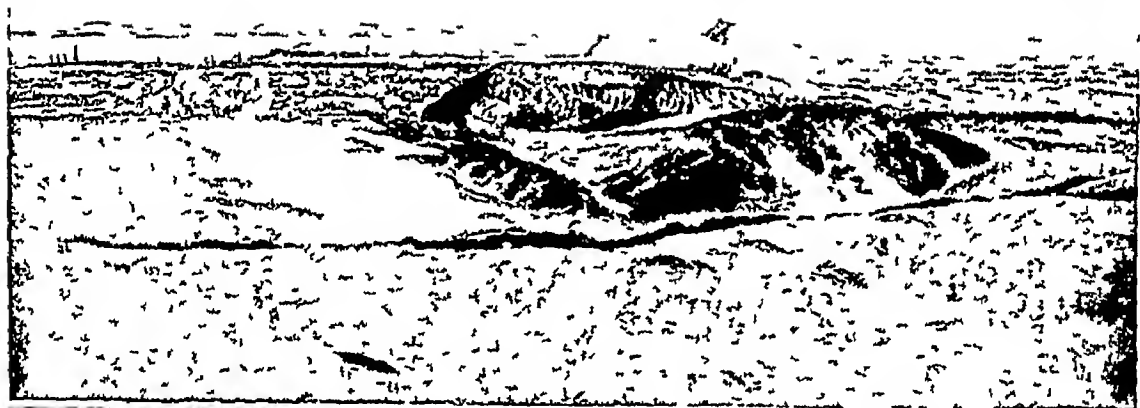
In the Silurian period the same general types of life were prevalent, but the species are so unlike those of the preceding period as to be readily distinguished by those familiar with fossils. The Devonian period is often known as the Age of Fishes, on account of the abundance of fish remains in the rocks of this system. Actually, it is far from certain that fish were more abundant than now, and the variety of species of fish, probably, was even less than exists at the present time.

The Devonian was, however, the first period when land living creatures began to be in evidence, these being centipede-like arthropods.

As its name implies, the Carboniferous period saw the deposition of the coal measures, and was therefore a period of great forest development,



## THREE PICTURED PERIODS OF GEOLOGICAL TIME



These pictures are from a diorama in the Geological Survey and Museum, London. At the top, a scene in the north-west Highlands of Scotland shows, in descending order on the right, white Cambrian quartzite, Pre-Cambrian Torridonian sandstone and Lewisian gneiss. In the central view of Edinburgh from the Braid Hills we see hills of hard volcanic rock with hollows carved out of softer sandstone and shale, the rounded contours are due to an ice-sheet. At the bottom is the Avon gorge at Bristol 300 feet deep, cut by the river in carboniferous limestone.

*Crown Copyright from photos supplied by the Director Geological Survey by permission of the Controller of H.M. Stationery Office*

though the trees were very unlike those of our own times. The moist, hot atmosphere favoured insect life, while the amphibians and reptiles put in a first appearance.

The Permian period represents a transition stage between the Palaeozoic and the Mesozoic eras. In the Permian period there was extensive glaciation in Australia, South Africa, India, and South America.

#### Land and Sea Move Up and Down

The several systems of Palaeozoic rocks have somewhat different distribution, and, since the area of the deposits of any period corresponds approximately with the submerged area of that period, the distribution of the several systems helps us to understand the relations of land and water during the several periods. In this way it is known that the relations of sea and land were different at different times. It would appear either that the continent repeatedly rose and sank, causing areas which were at one time submerged to become land, and vice versa, or that the sea-level itself rose and fell. If the sea-level rose, it would overspread the low lands, if it were lowered, it would cause areas which had been submerged to become land.

How far the many changes in geography during the Palaeozoic era were the result of land oscillations and how far of oscillations of sea-level, has never been fully determined. It would appear that the deep sea bottom has at no time been land, and that the areas which were alternately above and below sea-level were low when they were land, and covered only by shallow water when they were submerged. Moreover, all these generalizations apply to the conditions during later periods as well.

#### The Age of the Dinosaurs

The Mesozoic (formerly called Secondary) era, as the term indicates, was the era when life intermediate between the ancient and the present existed. This era is divided into several periods, as indicated in page 1818. During the Triassic period, which is not well represented in Britain, reptiles, perhaps, were the dominant type of life. They were not only numerous, but the individuals attained great size. The earliest known remains of mammals date from this period. Marine life abounded, but departed notably from the types which had prevailed in the Palaeozoic era. Vegetation was abundant, but of types now extinct or rare.

The Jurassic period followed, and the life of this period was somewhat different from that of the preceding, though the same general types abounded. Reptiles were the most distinctive type, and vast and wonderful dinosaurs, even larger than in the preceding period, roamed the earth. The oldest remains of birds are Jurassic.

The Jurassic period was followed by the Cretaceous period, during which our chalk hills

were laid down at the bottom of the sea. In the early part of the first period chalk was not being deposited, but in the latter part chalk deposits were in process of formation in many parts of the earth. The chalk deposits are made up, for the most part, of the shells of minute marine animals. (See Chalk). During the Upper Cretaceous period many modern types of plants and fishes made their appearance.

Mammals, the earliest remains of which are found in the rocks of the Triassic system, became the dominant land creatures early in the Cainozoic era, for the huge reptiles characteristic of the Mesozoic era had long disappeared. Reptiles still existed, but they were relatively small. As the Cainozoic era progressed, the forms of life approached more and more closely to those of the present time, and by the end of the Pliocene the life was nearly the same as now.

#### Why and How Life Changed

One theory ascribes this change from Mesozoic to Cainozoic life to a change of climate and ground surface. Before the change much of the ground was marshy, and since, under such conditions, size and power were more important than speed for survival, ponderous reptile forms dominated the earth. Further changes drained off the water, created large areas of hard ground suited to running, and supplanted the luxurious swampy vegetation with modern "dry land" flowering plants. These changes produced the running types of animal, with their speed and ability to range far in search of food, an advantage over the clumsy giant reptiles, which, therefore, gradually became extinct.

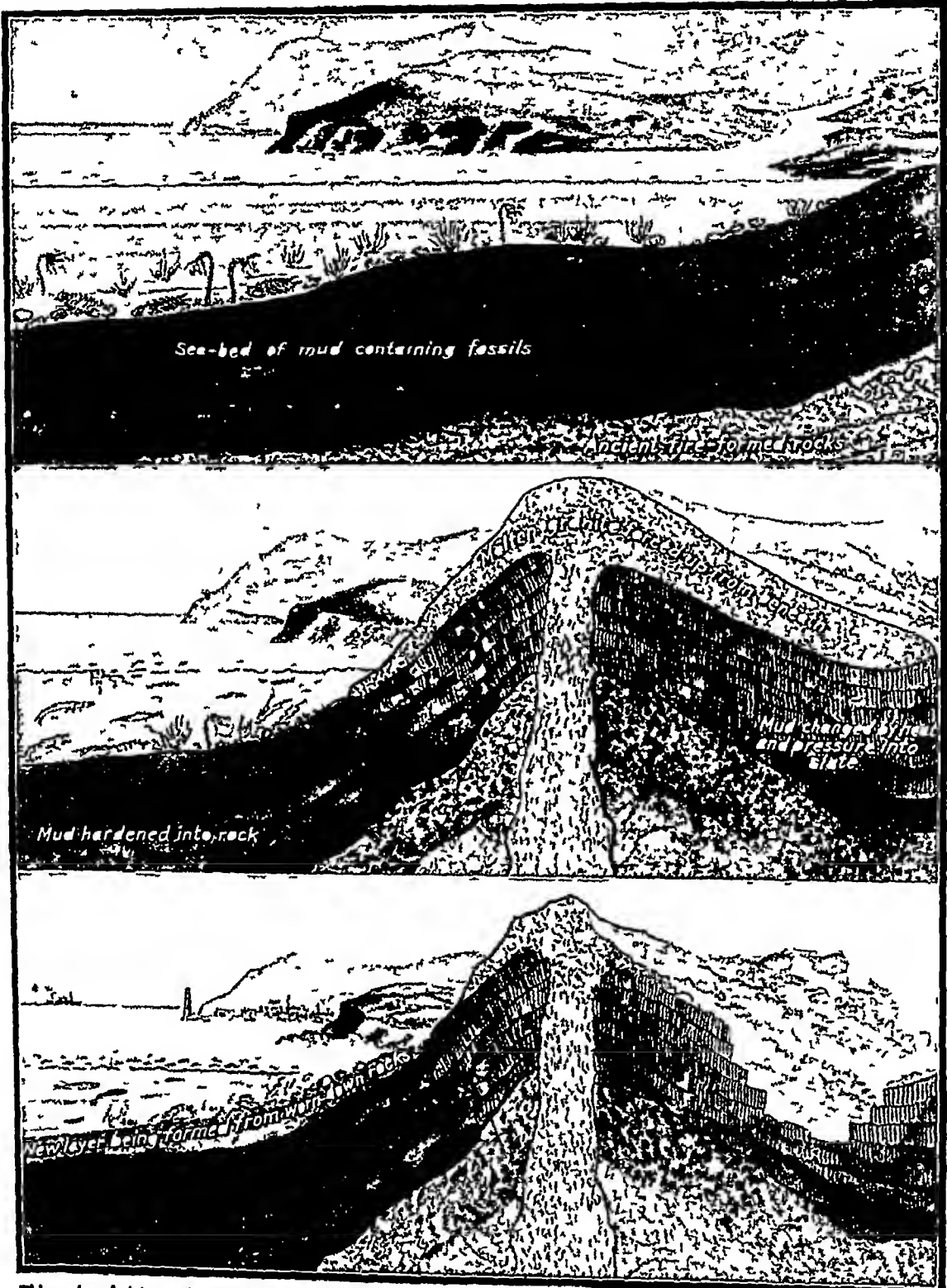
The Pleistocene period was a remarkable one, on account of the great climatic changes which occurred at this time. Coincident with these climatic changes was the spread of a large ice sheet, affecting especially the north western part of Europe.

#### How Old is the Earth?

The duration of the earth's history is a matter which has received much attention, but no conclusions have been reached which can be relied upon absolutely, beyond the very general one that the history of the earth has been exceedingly long. (See Earth). Various conjectures as to the number of years occupied in bringing the earth to its present condition have been made. They range from 25,000,000 years or so to 1,500,000,000, since the time of the formation of the oldest rocks now accessible. The Pre-Cambrian era was, perhaps, as long as all that followed. The Palaeozoic era was, perhaps, two or three times as long as the Mesozoic, and the Mesozoic longer than the Cainozoic.

The climatic changes which the earth has undergone have been great, but their causes are not well understood. There is little basis for the belief, formerly widespread, that the climate has

# HOW SCHOOL SLATES COME OUT OF THE SEA



This series of pictures illustrates the processes by which certain kinds of rock are made. In the first picture we see a bed of mud beneath the sea containing fossils and overlying the ancient fire-formed rocks. Ages later, perhaps, an immense fold of the earth's crust split and masses of molten rock welled up from below, flowing out over the surface. The heat and pressure of this molten mass turned the mud rock into slate. Then thousands and thousands of years later, part of the granite was worn away by the flowing waters of a river, leaving the slate exposed. On the other side of the cliff you see the sea grinding more rock into mud, which may perhaps in the course of the ages be buried beneath another eruption of molten rock and harden into a new layer of slate. And so the Old Earth goes on changing its skin, shifting its waters, and working over its raw materials. The process may seem slow to us, but Nature has "all the time in the world" to do her work. Indeed, when you think that all recorded history only reaches back some 6 000 years, and that a million years, or more than a hundred times the span of all human history, is only a small period in geologic time, you can see how deliberately Nature proceeds about her tasks.

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on the whole been growing cooler. Cold periods seem to have alternated with warmer ones. There was local glaciation in the Palaeozoic era, and extensive glaciation at the close of the Palaeozoic. There was glaciation in the early Cainozoic era, and very extensive glaciation later in that era, and there is some indication of cold periods at other times. There is also ample evidence that the lands of high latitudes have enjoyed genial, not to say tropical, climates during some later periods of the earth's history.

Volcanic activity, too, seems to have been greater at some periods than at others.

### What is the Use of Geology?

Although geology is among the youngest of the sciences, it is also one of the most useful. Much that is useful to mankind comes out of the earth. Fuel for warmth and power, stone, clay, and cement for our houses, metals for making the machines that serve the modern industrial world—all these are earth products.

These various useful commodities are not placed within the earth like plums in a pudding without law or order. Each deposit of every one of them is where it is for some good geological reason. The study of the origin, distribution, and laws of occurrence of such deposits is all part of the science of geology.

Geology makes a particularly strong appeal to the man who loves an outdoor life, "the glory of the sun and streams that murmur as they run." The earth itself is the great text book of geology, open everywhere to anyone who is willing and knows how to read its lesson. To become expert in his science, the geologist must travel widely and often to difficult and dangerous places. He should be proficient in all manners of travel—on foot, on horseback, by canoe, and by any conveyance that offers itself, able to camp and fend for himself wherever he may be.

Since geology is largely the application of other sciences to earth problems, the geologist must have at least an elementary knowledge of chemistry, physics, and mathematics. His work is largely the study of minerals, rocks, and ores, and their relations to one another, and particularly the relations of groups of rocks or rock formations to one another, and the relations of mineral deposits to the various rock masses in which they are found. Since a large part of his business is the making of maps, he must understand practical surveying and drafting.

### Where the Geologist Works

There are four kinds of activities in which most geologists find employment. These are

1. Work at colleges, universities, and technical schools
2. Work on state and national geological surveys, and in other research organizations
3. Work on staffs of mining companies
4. Work on staffs of oil and gas companies

Most of our larger universities maintain departments of geology, which give instruction in the various branches of geology, such as mineralogy, petrology (the science of rocks), economic geology, palaeontology (the study of fossils), and engineering geology, etc.

In Britain, all official geological research is in the hands of the Geological Survey, a body which has long been the first of its type in the field. The whole of Britain has long been mapped from a geological point of view by this organization, and the members of its staff are all fully trained experts, who may be called in by outside agencies needing the advice of a skilled geologist. All over the Empire, too, there are official geologists, and universities and other interested bodies, when sending expeditions to different parts of the world, invariably include a trained geologist in the party.

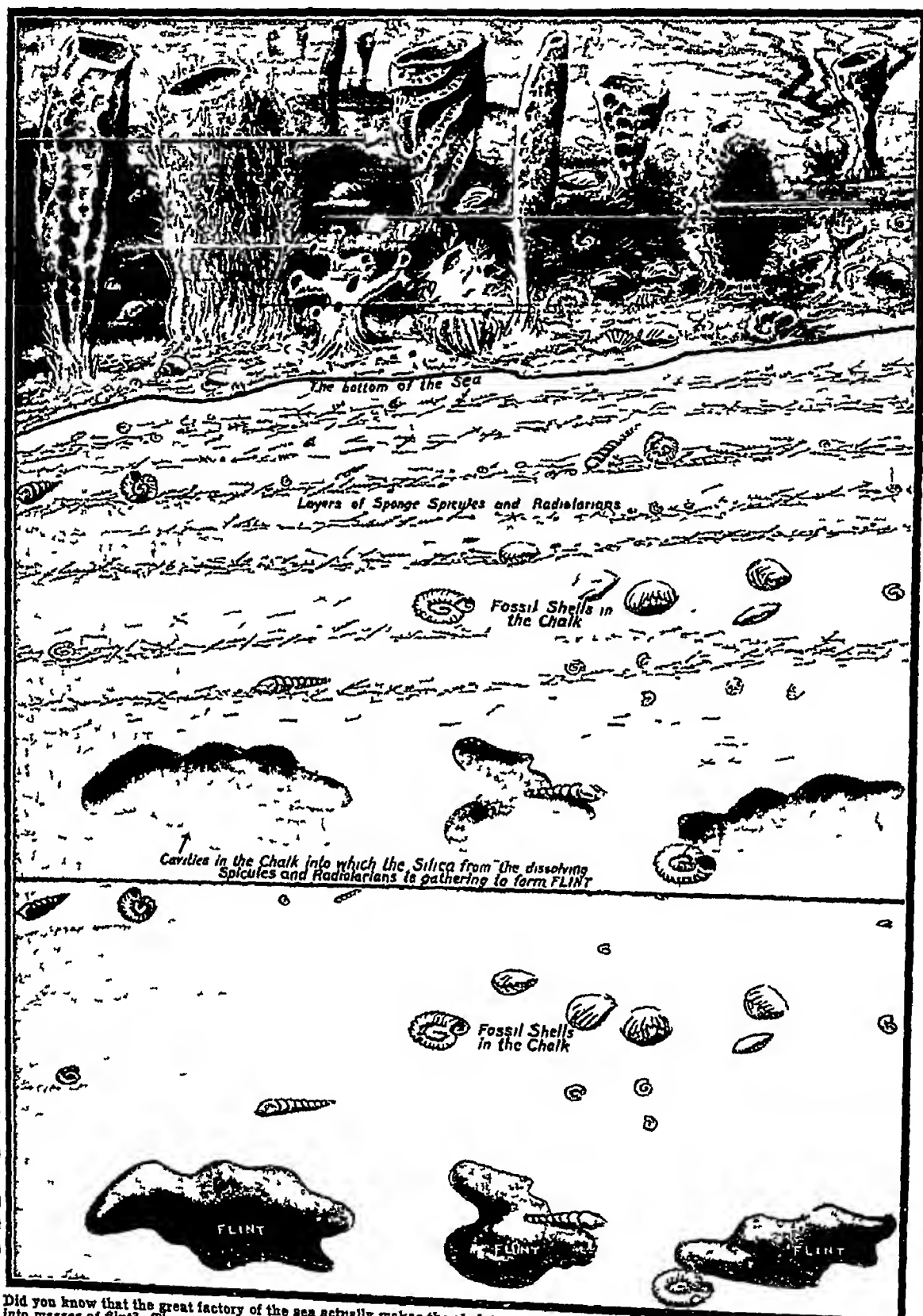
### Showing Where to Sink Mines

Nearly all mining organizations employ one or more geologists. Experience has taught them that they can work their deposits more profitably by having accurate maps showing their distribution, and that a knowledge of the occurrence and origin of the deposits is essential for the intelligent exploration and prospecting of ore-bearing lands. Most mining companies have accurate geological maps of their properties, and it is part of the geologist's work to keep these up to date as mining progresses. Moreover, the geologist is himself essentially able to guide operations in opening up new country, for he can tell where deposits of any sort are most likely to be found. A considerable number of geologists find employment in the examination and valuation of mines and prospects that are for sale, and in connexion with tax problems and other legal matters.

Similarly, large oil companies also maintain geological staffs. By mapping the rocks above the oil-bearing beds, it is possible to locate the oil, and thus to discover the places that are most likely to be productive. (See Petroleum.) Nearly all wells are drilled on the advice of geologists.

Apart from the four major lines of work outlined above, the geologist finds employment in connexion with problems of trade, of land valuation and classification, of agricultural and soil surveys, and so forth. His advice is frequently required in connexion with engineering problems, such as the location of dam sites, water and sewage systems, irrigation and drainage projects, and foundations for buildings. Many errors in the location of dam sites and similar engineering projects, that have resulted in the loss of life and property, could have been avoided if those responsible had sought the advice of trained geologists. Today this expert aid is regarded as essential to almost any big civil or mechanical engineering undertaking.

# HOW FLINT WAS MADE FROM TINY SEA ANIMALS



Did you know that the great factory of the sea actually makes the skeletons of sponges and other tiny animals (the "radiolarians") into masses of flint? The process is long but quite simple. The bodies of these animals fall to the ocean bottom. There they are buried under layers of chalk formed by the shells of other ocean creatures. In the course of time cavities come in the chalk beds and the stony material (silica) left by the decay of the "spicules" composing the skeletons of the sponges and radiolarians seeps into these holes. Here it hardens and becomes flint. Sometimes these little bodies fossilize instead of dissolving, and it is by finding these fossils both in the chalk and in the flint that scientists have been able to learn the entire process.



# The SCIENCE of SURFACES and SOLIDS

*Few schoolchildren will think we have much to thank Euclid for, and geometry is not one of the most popular school subjects. But it can be made interesting and is perhaps the most useful branch of mathematics*

**Geometry.** One of the oldest of the mathematical sciences, geometry had its origin in earth measurements in the early days of the



Egyptian and Babylonian civilizations. The word geometry (from Greek *ge*, "earth," and *metron*, "measure") denotes this early function. The lands of Egypt, swept by the floods of the Nile, had often to be resurveyed and remeasured to establish the vanished boundaries, and in 2000 B.C. the "rope stretchers" or surveyors of Egypt had their own crude way of erecting a perpendicular measuring distances, and calculating areas. In building the pyramids they applied well-defined mathematical principles, later incorporated into geometry as we now know it.

It was left to the reasoning mind of the Greek to make all this mathematical knowledge, dealing with the measurement of space, an exact science. One branch, "plane geometry," deals with circles, angles, squares, etc., that is, with two-dimensional measurements, and another, "solid geometry," with cubes, spheres, and other three-dimensional bodies.

In the history of the Greek development of geometrical reasoning there are many names, but three stand out. Thales (640 B.C.—about 550 B.C.), one of the "seven wise men," is credited with originating the geometry of lines and angles, and developing demonstrations of things which others took for granted. Pythagoras (about 582 B.C.—about 500 B.C.), and all the members of the great Pythagorean school studied mathematics in secret. Pythagoras proved that the

*square on the hypo-*

*tenuise of a right-angled triangle is equal to the sum of the squares on the other two sides*, and this is known as the Pythagorean theorem. It is one of the most important mathematical truths discovered. Euclid (about 300 B.C.) is the one name known when most others are forgotten in the history of geometry, and his work has been the standard down to our own day. In fact, the name Euclid is synonymous with pure plane and solid geometry.

The student who approaches the study of geometry must be thoroughly familiar with the measuring of lines—that is, from point to point—by practice with a rule, a compass, or squared paper ruled to inches and fractions of an inch. When he applies this to measuring a room, it is with the object of applying another fundamental idea of geometry, that of ratio. When we say a room is ten yards long, we mean that it is ten times as long as the standard unit, in this case a yard, so that the ratio of the yardstick to the length of the room is as 1 to 10. Every measurement is the determination of a ratio of some sort and is often expressed as a fraction.

From these simple exercises we may proceed to some of the simpler geometrical constructions that arise out of the relation of lines to one another, and to the definition of the basic terms used in geometry.

If a straight line, as  $OX$  in any of the drawings of Fig. 1, rotates in a plane about a fixed point, as  $O$ , in the direction indicated by the arrow-heads (anti-clockwise) until it reaches the position  $OT$ , it is said to turn through the angle  $XOT$ . Thus, an angle is the amount of turning made by a line rotating about a fixed point in a plane (flat surface).

As the rotation continues, the size of the angle increases. These terms are used:

**Vertex**—The fixed point  $O$  is called the vertex of the angle.

**Initial and Terminal Sides**—The line  $OX$  is called the initial side of the angle. The line  $OT$  is called the terminal side.

**Symbol for Angle**—The symbol for "angle" is  $\angle$ , for "angles" it is  $\angle s$ . Thus, Angle  $XOT$  is written  $\angle XOT$ .

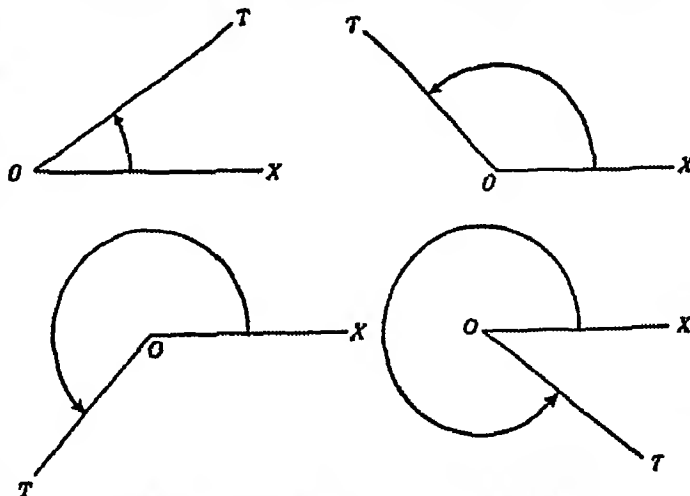


Fig. 1.—Illustrating the Definition of an Angle.

## GEOMETRY

**Kind of Angles**—If a line rotates about a fixed point in a plane so as to make one fourth of a complete turn, 90 degrees, the angle formed is called a "right angle" (rt  $\angle$ ) and equals 90 degrees (See Fig 2a)

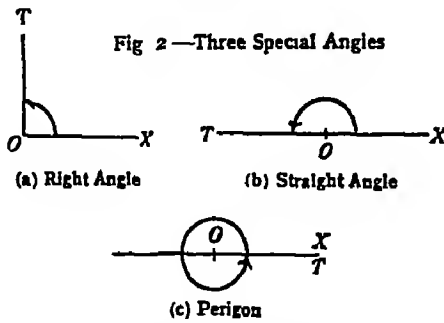


Fig 2—Three Special Angles

If the line makes one half of a complete turn, i.e., 180°, the angle formed is called a 'straight angle' (st.  $\angle$ ) (See Fig 2b) If the line makes a complete turn, the angle formed is called a *perigon* (See Fig 2c)

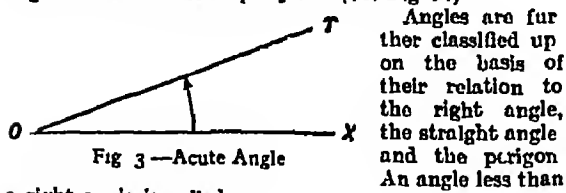


Fig 3—Acute Angle

Angles are further classified up on the basis of their relation to the right angle, the straight angle and the perigon. An angle less than a right angle is called an "acute angle" (Fig 3) An angle which is greater than a right angle and is less than a straight angle is called an "obtuse angle" (Fig 4) An angle greater than a straight angle and less than a perigon is called a *reflex angle* (Fig 5)

Fig 4—Obtuse Angle

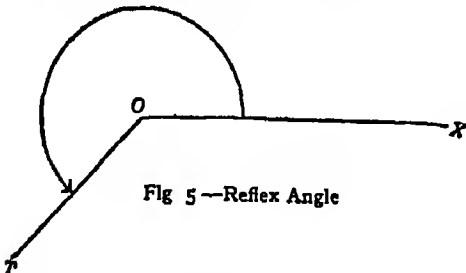


Fig 5—Reflex Angle

### Notation for Reading Angles

There are three common methods by which one may denote angles (1) Designate the angle formed by two lines OX and OT, as the angle  $\angle XOT$  or the angle  $\angle TOX$ . Here the first and last letters denote points on the lines forming the angle and the middle letter denotes the point of intersection (the vertex). In reading "angle  $\angle XOT$ " we regard OX as the initial side and OT as the terminal side (2) Denote the angle by a small letter placed as  $x$  in Fig 7. In writing equations this method is the most convenient (3) Denote the angle by the letter which is written at the point of intersection of the two sides of the angle as 'angle A'. This last method is used only when there is no doubt as to what angle is meant. It is the method employed by land surveyors.

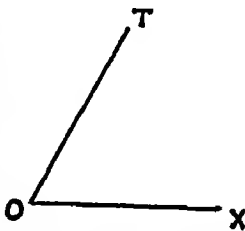


Fig 6

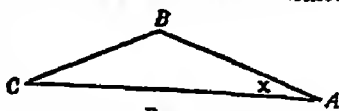


Fig 7

If a line OX be taken as the initial side of an angle (see Fig 8), and the line be rotated one complete turn (a perigon), any point, as P, on the line OX will trace a curved line which we call a "circle". Thus a circle is a closed curve, all points of which lie in the same plane and are equally distant from a fixed point

The following terms are used in connexion with the circle

**Centre and Circumference**—The fixed point O is the "centre" of the circle. The length of the curve (circle) is called the 'circumference' (distance round) of the circle

**Radius and Diameter**—A line drawn from the centre of a circle to any point on the circle is a 'radius'. Thus, OP, OP<sub>1</sub>, OP<sub>2</sub>, OP<sub>3</sub> and OP<sub>4</sub> are radii of the circle. A line connecting two points on the circle and passing through the centre of the circle is called a "diameter"

From the definition of radius given above, it is clear that in a given circle or in equal circles, one radius has the same length as any other. Thus we obtain the following important geometric relation: *Radii of the same circle or of equal circles are equal* ('Radii' is the plural of 'radius')

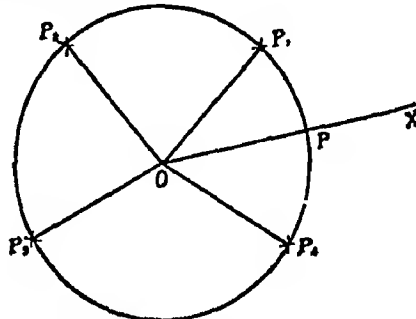


Fig 8—The Circle

**Ratios and Measurements**—The circumference of a circle has a certain ratio to the diameter (twice the radius) which is denoted by the Greek letter  $\pi$  ( $\pi$ ). The value of  $\pi$  is usually taken as 3.1416 and this ratio is known as a mathematical constant. The circumference of a circle therefore is expressed by the formula  $2\pi r$  and the area by  $\pi r^2$  in which  $r$  is the length of the radius

**Arc to Subtend Central Angle**—An arc is a part of a circle. If two radii are drawn from the centre of the circle to two different points on the circle they cut off an arc on the circle. The symbol for 'arc' is  $\frown$ . Thus,  $\frown AB$  is read "the arc AB". The angle formed at the centre of the circle is said to 'subtend' the arc. The angle at the centre is called a "central angle"

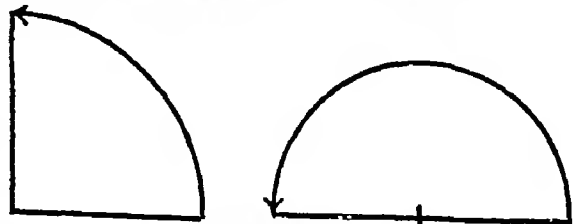


Fig 9—Quadrant and Semicircle.

**Quadrant and Semicircle**—An arc equal to one-fourth of a circle is called a 'quadrant'. An arc equal to one-half of a circle is called a 'semicircle' (Fig 9)

**How We Measure Angles**—In many instances the process of measuring angles is as important as that of measuring distances. An angle is measured when we find how many times it contains another angle selected as a unit of measure

The 'protractor' is an instrument devised for measuring and constructing angles. The protractor

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commonly consists of a semicircle divided into 180 equal parts. Each of these equal parts is called a degree of a circle which contains 360 degrees.

If straight lines are drawn from each of these points of division on the semicircle to the centre  $O$ , 180 equal angles are formed, each of which is an angle of one degree ( $1^\circ$ ). Thus, the "unit" of angular measure is the "degree." A degree is divided into 60 equal parts, each of which is called a "minute" ( $1'$ ), and each minute is divided into 60 equal parts each of which is called a "second" ( $1''$ ).

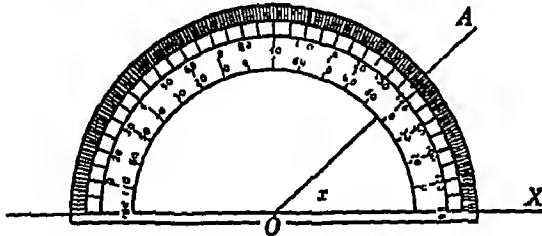


Fig. 10 — Measuring Angles with a Protractor

**How to Use the Protractor** — The protractor may be used to measure a given angle. Thus, to measure a given angle  $x$  place the protractor so that the centre of the protractor (point  $O$  in Fig. 10) falls upon the vertex and makes the straight edge of the protractor coincide with (fall upon) the initial side of the given angle  $x$ . Now, observe where the terminal side  $OA$  of the given angle intersects (crosses) the rim of the protractor. Read the number of degrees in the angle from the scale on the protractor, and you get the size of the angle  $\angle AOA$ .

The protractor is also useful in constructing angles of a required size. For example, to construct an angle of  $42^\circ$  draw a straight line  $OX$  (Fig. 10) and place the straight edge of the protractor on the line  $OX$  so that the centre rests at  $O$ . Count  $42^\circ$  from the point on  $OX$  where the curved edge touches  $OX$  and mark the point  $A$ . Connect  $A$  and  $O$ , and the angle thus formed will contain  $42^\circ$ .

One of the important phases of geometry work is that of constructing perpendiculars, angles, parallel lines, and so on.

For example, let us consider the following problem:

At a given point on a given line to erect a perpendicular to that line by using ruler and compasses.

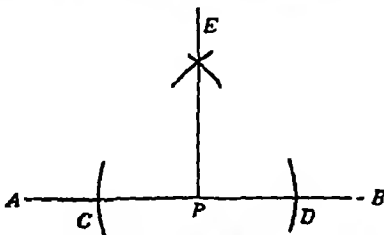


Fig. 11 — How to Erect a Perpendicular

**Construction** — Let  $AB$  be the given line and  $P$  the given point (Fig. 11). With  $P$  as centre and with a convenient radius draw arcs intersecting  $AB$  at  $C$  and  $D$ .

With  $C$  and  $D$  as centres and with a radius greater than  $\frac{1}{2}CD$  draw two arcs. These will intersect at some point  $E$ . Join  $EP$ . Then  $EP$  is the required perpendicular.

Another well-known construction problem is this:

At a given point on a given line to construct by means of a ruler and compasses an angle equal to a given angle.

**Construction of an Angle** — Let  $DEF$  in Fig. 12 be the given angle and let  $P$  be the given point on the given line  $AB$ .

With  $D$  as a centre and  $DE$  as a radius, draw a circle. With  $P$  as a centre and with the same radius ( $DE$ ) draw another circle. With  $E$  as centre and  $ER$  as radius cut

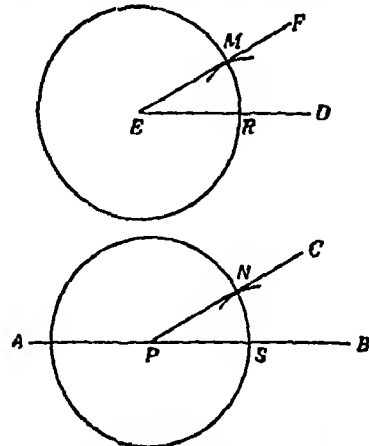


Fig. 12 — Constructing an Angle Equal to a Given Angle.

an arc through  $M$ . With  $S$  as a centre and the same radius  $RM$  cut an arc at  $N$ .

The  $\angle BPC$  is the required angle.

**Definitions** — If two lines form right angles with each other, they are said to be "perpendicular" to each other. The symbol for "perpendicular" is  $\perp$ . The meaning of "parallel lines" is shown in Fig. 13.  $AB$  and  $CD$  in that figure have had the same amount of angular rotation from the initial line  $EF$ . Thus, they have the same direction and are said to be "parallel." The symbol for "parallel" is  $\parallel$ . Thus  $AB \parallel CD$  is read "AB is parallel to CD."

The angles  $x$  and  $y$  in Fig. 13 are called "corresponding" angles, and the line  $EF$  a "transversal." It is clear that the lines are parallel only when the corresponding angles are equal and that the corresponding angles are equal, only when the lines are parallel.

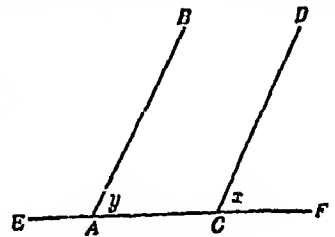


Fig. 13 — Parallel Lines.

Another important construction problem is that of drawing a line parallel to a given line. This we shall now explain.

**Construction** Choose a point  $P$  outside the given line  $AB$  (Fig. 14). Draw a line through  $P$  so as to form a convenient angle  $x$  with  $AB$ . Call the point of intersection  $D$ . At  $P$ , using  $DP$  as initial line construct an angle  $y$  equal to angle  $x$  (use method shown in Fig. 12).

Then  $PR$  and  $AB$  are parallel because they have had the same amount of rotation from the initial line  $PD$ .

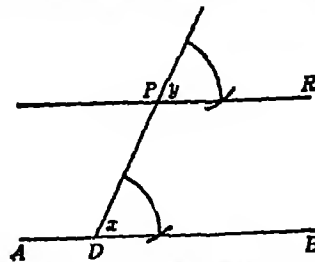


Fig. 14 — How to Draw Parallel Lines

If one pair of parallel lines cross (intersect) another pair, the four-sided figure thus formed is

called a "parallelogram", that is, a parallelogram is a quadrilateral whose opposite sides are parallel.

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If we remember the method used for constructing one line parallel to another, it will be easy to construct a parallelogram

**Construction** Draw a working line  $AB$  (Fig 15) Draw  $AR$  making a convenient angle with  $AB$  Through any point as  $P$  on  $AR$  draw a line  $PV$  parallel to  $AB$  Through any point as  $M$  on  $AB$  draw a line  $MT$  parallel to  $AR$  The figure  $AMSP$  is a parallelogram, for its opposite sides are parallel

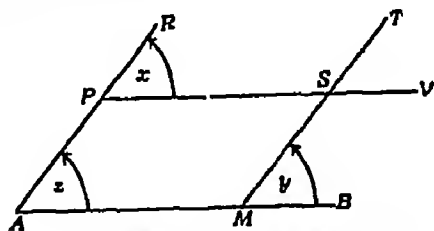


Fig 15—How to Construct a Parallelogram

If one of the interior angles of a parallelogram is a right angle, the figure is a *rectangle* (Fig 16) Thus, a *rectangle* is a *parallelogram* in which one interior angle is a right angle If all the sides of a rectangle are equal, the figure is called a "*square*" (Fig 17)



Fig 16

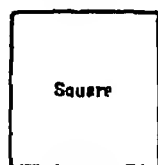


Fig 17

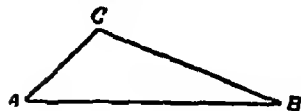


Fig 18

If we determine the amount of area enclosed within a polygon, or several sided figure, as in the triangle  $ABC$  in Fig 18, we are *measuring the area* of the triangle As in measuring length, the process is one of comparison We compare the area of the given polygon with some standardized unit of area, and

determine how many units are contained in the polygon, i.e., we determine the ratio between the polygon's area and a standard unit of area

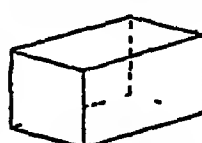
The unit of area is a square, each of whose sides is a standard unit of length Such a unit involves length and width Thus, we may measure area and express the result in square feet, square inches, square metres, etc

The drawings in Fig 19 represent geometric solids A solid is commonly thought of as an object that occupies a portion of space It is separated from the surrounding space by its surface In geometry we study only the form of the solid and its size We are not interested in colour, weight, etc A solid differs from the figures we have been studying in that it does not lie altogether in a plane, but involves a third dimension A *frustum* is that part of a cone left after the top has been cut off by a plane parallel to the base

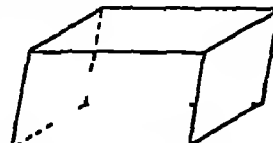
**Cube**—The cube has six faces all of which are squares Two faces intersect in an edge

**Rectangular Parallelepiped**—The faces of a rectangular parallelepiped are all rectangles

**Oblique Parallelepiped**—The faces of an oblique parallelepiped are all parallelograms



Rectangular Parallelepiped



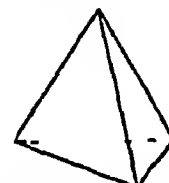
Oblique Parallelepiped



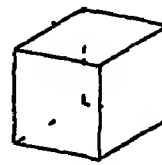
Sphere



Frustum of a Pentagonal Pyramid



Triangular Pyramid



Cube

Fig 19—A Group of Familiar Solids

**Measurement of Volume Unit of Volume**—When we determine the amount of space enclosed within the surface of a solid we are measuring the 'volume' of the solid To measure the volume of a solid, we compare the solid with a cube each of whose edges equals a unit of length The volume is expressed numerically by the number of times the unit cube goes into the solid The unit cube is called the *unit of volume*.

### Things to Remember in Geometry

We must keep clearly in mind the definitions of certain geometrical terms

**Theorem**—In our geometry work we are concerned mostly with the proving of certain geometric relations For example, we may prove that "The sum of the interior angles of a triangle is two right angles" Such a statement of a geometric relation is called a "*theorem*" Thus a theorem is something to be proved

**Problem**—A "problem" in geometry is something to be done Thus 'To draw a perpendicular to a given point in a line' is a problem

**Proposition**—A 'proposition' in geometry may be either a theorem or a problem

**Corollary**—A truth which may grow out of, or depend upon the truth of a proposition is called a 'corollary'

In geometry we should know the following

*Angle pairs formed by two lines cut by a transversal*

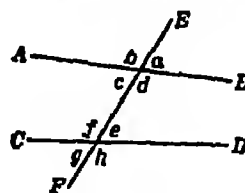


Fig 20

When two lines such as  $AB$  and  $CD$  are cut by a transversal  $EF$ , as in Fig 20—

the angles  $c, d, e, f$  are called "interior angles", and the angles  $a, b, g, h$ , are called "exterior angles",

the angles  $\begin{cases} a \text{ and } e \\ b \text{ and } f \\ d \text{ and } h \\ c \text{ and } g \end{cases}$  are called corresponding angles,

the angles  $\begin{cases} d \text{ and } e \\ c \text{ and } f \end{cases}$  are called 'interior angles on the same side of the transversal,

## GEOMETRY

the angles  $\begin{Bmatrix} d \text{ and } f \\ c \text{ and } e \end{Bmatrix}$  are called "alternate interior" angles on *opposite* sides of the transversal,

the angles  $\begin{Bmatrix} b \text{ and } h \\ a \text{ and } g \end{Bmatrix}$  are called "alternate-exterior" angles on *opposite* sides of the transversal

The student of geometry should be careful to remember that when the lines cut by the transversal are parallel—

- (a) corresponding angles are equal,
- (b) alternate interior angles are equal,
- (c) alternate-exterior angles are equal,
- (d) interior angles on the same side of the transversal are supplementary (together, equal to two right angles)

In geometry we have various methods of proving propositions. There is no one particular or invariable method of proof. The student of geometry should therefore become familiar with these methods. We shall explain each, and illustrate some of them by examples.

The demonstration of a theorem consists of three parts: the part that is given (the *hypothesis*), the part that is to be proved (the *conclusion*), and the *proof*. And in proving a theorem one should give a reason for each step taken.

### How to Prove a Proposition

The briefest general directions for proving a proposition are

- (1) Be sure to read the proposition carefully.
- (2) If the proposition is a theorem or exercise, draw a careful general figure (i.e. if the theorem concerns a triangle draw a triangle all of whose sides are unequal (scalene) and not one all of whose sides are equal (equilateral) or one two of whose sides are equal (isosceles)).
- (3) Write down clearly the hypothesis (the given part) and the conclusion (what is to be proved) and do this in terms of the letters in your figure.
- (4) Try to work out the proof by falling back on any thing you have previously learned that may apply, or draw some construction line or lines that may suggest the proof.
- (5) Follow the outline given below for the form of your proof.

This makes it necessary to base each statement on (1) the hypothesis, (2) an axiom, (3) a definition, or (4) some other theorem which has previously been proved by geometrical methods.

The following proof will serve as an illustration. The theorem is: *The sum of the interior angles of a triangle is  $180^\circ$*  (Fig. 21)

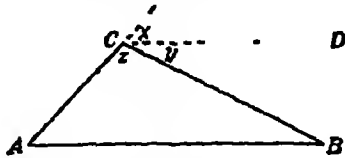


Fig. 21

**Hypothesis** Let  $ABC$  be any given triangle

**Conclusion** Then  $\angle A + \angle B + \angle C = 180^\circ$

**Proof**

**STATEMENTS**  
 Draw  $CD \parallel AB$   
 Then  $\angle x = \angle A$

**REASONS**  
 Because corresponding angles formed by two parallel lines cut by a transversal are equal

And  $\angle y = \angle B$

But  $\angle x + \angle y + \angle z = 180^\circ$

$$\angle A + \angle B + \angle C = 180^\circ$$

At the end of such a demonstration we generally write  $Q. E. D.$  (*Quod erat demonstrandum*, "which was to be demonstrated"), or, if it is a problem,  $Q. E. F.$  (*Quod erat faciendum*, "which was to be done").

**METHOD OF PROOF BY SUPERPOSITION** The method of proof by superposition is the method used to show that certain figures have the same shape and same size, that is, are equal in all respects (congruent figures). The symbol for "congruent" is  $\equiv$ . It is the method always used to prove two triangles identical when two sides and the included angle of one are equal respectively to two sides and the included angle of the other. The proof is as follows (Fig. 22)

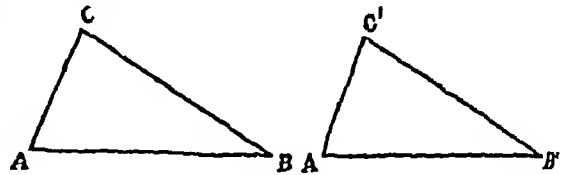


Fig. 22

**Hypothesis** If in the  $\triangle ABC$  and  $\triangle A'B'C'$   $AC = A'C'$   
 $AB = A'B'$  and  $\angle A = \angle A'$

**Conclusion** Then  $\triangle ABC \equiv \triangle A'B'C'$

**Proof**

Imagine the triangle  $ABC$  placed upon the triangle  $A'B'C'$  so that angle  $A$  shall fit exactly upon its equal angle,  $A'$ ,  $AB$  falling upon  $A'B'$  and  $AC$  upon  $A'C'$ .

Then since  $AB$  is given equal to  $A'B'$ ,  $B$  will fall upon  $B'$ , and since  $AC$  is given equal to  $A'C'$ ,  $C$  will fall upon  $C'$ .

Then  $BC$  will fall along and coincide with  $B'C'$ ; otherwise there would be two different straight lines connecting the two points  $B$  and  $C$ , and this is impossible because only one straight line can be drawn between two points.

Hence, the two triangles are congruent i.e. they coincide and are therefore equal in all respects.

Since  $ABC$  and  $A'B'C'$  are any two triangles having two sides and the included angle of one equal to the corresponding parts of the other the theorem is true.

**METHOD OF PROOF BY CONGRUENT TRIANGLES** In order to prove that certain lines or angles are equal, it is often expedient to show that the lines or angles are corresponding (homologous) parts of congruent triangles and are therefore equal.

For example, let us suppose we want to show that the base angles of an isosceles triangle are equal. To do this we would bisect the vertex angle of the isosceles triangle and then prove the two triangles thus formed congruent. The base angles of the original isosceles triangle would then be corresponding parts of the two little congruent triangles and therefore would be equal.

**INDIRECT METHOD** The indirect method, or *reductio ad absurdum* (reducing to an absurdity), is one that is sometimes employed in geometry. The following proof will illustrate.

**Theorem** If each of two lines is parallel to a third line they are parallel to each other (Fig. 23)

**Given**  $AB$  and  $CD$  each parallel to  $EF$ , to prove  $AB \parallel CD$





was a George who was venerated as a saint at Lydda in Palestine, but his life is unknown, except for unproved statements that he held a high military command in the Roman army, and visited England on an expedition. We do not even know why he was adopted by England as her patron saint, ironical foreigners have suggested that, as a "nation of shopkeepers," the English naturally adopted as their patron a man who is said to have made a fortune supplying bacon to the Roman army!

But these are all guesses. Probably the only historical fact concerning the patron saint of England is that he was martyred in the year 303 during the Emperor Diocletian's persecution. According to the Golden Legend—the collection of



ST GEORGE AND THE DRAGON

This vivid picture, now among the art treasures of Leningrad, is by Raphael, the great Renaissance Italian painter. There is a belief that the dragon represents the Evil One, or Antichrist.

lives of the saints compiled by Jacobus de Voragine, archbishop of Genoa—St. George, having slain the dragon, put off his knightly habit, gave all he had to the poor, went forth to preach Christianity, and was martyred.

St. George first became recognized as England's patron saint under the Norman kings. In 1346 Edward III founded the Order of the Garter, in the insignia of which the George, representing St. George and the dragon, is suspended from the collar. Some years later Edward IV built the magnificent St. George's Chapel at Windsor, where, in the reign of Henry V, the

supposed heart of the saint was deposited as a precious relic. St. George is also the patron saint of Portugal and of Aragon. His feast-day is April 23.

## The Six GEORGES of GREAT BRITAIN

*An historic name among English kings is George, though the first four of its bearers were little English in their manners and little honoured then or since. But George V and George VI have won intense loyalty.*

**George.** **KINGS OF GREAT BRITAIN** It was the marriage of the daughter of James I of England to Frederick, Count Palatine of the Rhine (see Thirty Years' War), that eventually brought to the British throne the Hanoverian or Guelph (Guelph) line of rulers, six of whom have borne the name of George.

GEORGE I, a grandchild of this marriage, was Elector of Hanover. Born March 28, 1660, he succeeded to the British throne as the nearest Protestant heir on the death of Queen Anne. He ruled Great Britain, in addition to his German state, from 1714 to his death, June 11, 1727, dividing his time between the two countries. He was a silent awkward man, 54 years of age when he came to the English throne, and spoke only German. Because of this and of his paramount interest in his German lands, he left almost everything to his English ministers, in whom he had implicit confidence. He gradually ceased even to attend Cabinet meetings. Sir Robert Walpole, the head of the Cabinet and the first real Prime Minister, became in effect the actual ruler of Great Britain so long as he

was supported by Parliament. Adherents of the Jacobite (exiled Stuart) line were easily put down in 1715.

GEORGE II, who ruled from 1727 to 1760, was, like his father, more interested in Hanover than in England. Born November 10, 1683, he was a vain, pompous man, fond of show but extremely economical. One of his favourite diversions, it is said, was counting his money like the king in the nursery rhyme. Although George II spoke broken English, he, too, left the management of affairs first to Walpole and later to the elder William Pitt, under whom the country gained brilliant victories in the French and Indian War (See Chatham, William Pitt, Earl of). The Jacobite rising of 1745 was a much more serious affair than the rebellion of 1715, but it too proved unsuccessful. (See Pretender.) George's queen, Caroline of Anspach, was a woman of remarkable ability, and proved a tower of strength to him. George died October 25, 1760.

GEORGE III, who was born June 4, 1738, and reigned from 1760 to 1820, was the grandson of George II. His father, Frederick, Prince of

## GEORGE

Wales, had been on the worst possible terms with George II, but had died in 1751. George III was the first of the Hanoverian rulers who was born and educated in Britain. From his teachers, especially the Earl of Bute, and also from his mother—who continually urged him, "George, be king"—George III drew the idea of restoring the king of England to his old position of power.

### The King Who Lost America

But this could have been done only by a strong king, and George III had but average ability. He had, however, more than average obstinacy, and he refused to give up his course until he had lost for England her 13 American colonies and "inflicted more profound and enduring injuries upon his country than any other modern English king." Lecky, the historian just quoted, further says that George III spent his long reign—longer than that of any other British ruler except Queen Victoria—in "obstinately resisting measures which are now almost universally admitted to have been good, and in supporting measures which are as universally admitted to have been bad."

He did not dare to attempt to rule without Parliament, as the Stuarts had done, but he sought to corrupt it—by gifts of offices, titles, contracts, and even money—and so built up a party known as "the king's friends." With the triumph of the colonists at Yorktown and the fall of Lord North, the king's figure head

minister, George's reactionary rule was ended. From time to time he was subject to attacks of insanity, and in 1811 his reason permanently broke down. During his later years his popularity greatly increased. He "gloried in the name of Briton," was known popularly as "Farmer George" and was widely respected for his moral virtues. He died January 29, 1820.

GEORGE IV (1762–1830), the son of George III, was born August 12, 1762. He was a dissolute and incompetent ruler, though he prided himself on being "the first gentleman of Europe." For nine years before his accession in 1820, he had been Prince Regent, owing to his father's insanity. More wicked kings have reigned over England, but none who was more contemptible or more heartily disliked. As a youth he was handsome and cultured, but his profligacy and extravagance brought him into bad odour. Setting up his own establishment in 1781, he finally broke with his father, consorting with Fox and the Whigs, and making merry with the most reckless gamblers of the town. His unbridled extravagance was the chief cause of his unpopularity, which was later increased by his ill-bred jests at his father's expense. His extravagance embraced, besides jewellers' and tailors' bills and gaming debts, expensive schemes for building the Pavilion at Brighton, where he spent much of his time, and for clearing London streets so that he might ride at



### TWO GEORGES WHO WERE MORE GERMAN THAN ENGLISH

The most intimate and amusing account of our Hanoverian kings is given by Thackeray in his 'Four Georges'. George I and George II, the two shown here, did not do much as monarchs but they unintentionally assisted the development of the British constitution, for, since they could not speak English properly, somebody had to act as the King's deputy in Parliament. Thus we gained our first Prime Minister Sir Robert Walpole, who had to converse with George I (left) in Latin!

Left from anonymous painting after Kneller right from mezzotint after Thomas Hudson both National Portrait Gallery

## GEORGE

ease to Regent's Park His treatment of his young queen was abominable, and when he attempted to divorce her a wave of indignation swept over the land The government, both in Great Britain and Hanover, was in the hands of his ministers His brother, William IV, succeeded him in 1830, the only child of George IV (a daughter) having died some time previously William IV in turn was succeeded by his niece Victoria, daughter of his younger brother, the Duke of Kent (See Victoria)

GEORGE V (1865-1936), the grandson of Queen Victoria and son of Edward VII, was born June 3, 1865 As a young man he was trained for the sea, and had risen to be a commander in



the British Navy when the death of his elder brother opened to him, at the age of 27, the eventual succession to the throne

As king he ever maintained the wise policies of constitutional rule followed by his father and grandmother Like his father, he had gained personal knowledge of the outlying posts of the Empire by a tour of the Dominions and colonies before he became king During the World War he crossed over to France several times, and was the first British king since 1743 to join his armies in the field In 1917 he announced that henceforth his family would be known as the house of Windsor

For nearly twenty years after the conclusion of peace George continued to rule his great Empire, and during this period the crown became, as it had never been before, the connecting link between the Mother Country and the self governing Dominions In May, 1935, the Silver Jubilee of his reign was celebrated

### 'FARMER GEORGE' AND HIS SON

George III was interested in all State activities Above, he is seen reviewing the 10th Hussars. But the spendthrift George IV preferred the luxury of Brighton where we see him (in the lower picture) riding on the Promenade.

Top from painting by Sir William Beechey

In 1928-29 the king had a serious illness, but he recovered A second illness, however, proved fatal, and he died at Sandringham, January 20, 1936 He was the first English king to speak to his people, including those of the Empire, through the microphone

In 1803 George married Mary, the only daughter of the duke of Teck, and she survived her husband Five of their children reached maturity Edward, Prince of Wales, who became king as Edward VIII, the Duke of York, who succeeded his brother as

George VI, the Dukes of Gloucester and Kent, and Mary, the Princess Royal, Countess of Harewood

GEORGE VI (born 1895), King of Great Britain After the abdication of Edward VIII (qv), his brother, the Duke of York, ascended the throne He was publicly proclaimed under the name of George VI on December 12, 1936 The second son of King George V and Queen Mary, Albert Frederick Arthur George was born at York Cottage, Sandringham, on December 14, 1895 From his earliest boyhood his education was carefully planned It was decided that, like his father, he should adopt the Navy as his profession, and in 1909 he went to school at Osborne He spent two years there and two at Dartmouth, taking the usual examinations with the other boys Just after his 17th birthday he went to sea in H M S Cumberland, visiting the West Indies and Canada, which dominion he was the first of the king's sons to visit On the



KING GEORGE V

"The Times"

King George V is here seen at the microphone at Sandringham, from where towards the end of his reign he spoke a Christmas message to his people throughout the Empire. The King's first broadcast was made in 1922, and his last only a few weeks before his death.

outbreak of war in 1914 he was a midshipman in H M S Collingwood, but his service was interrupted by an operation for appendicitis. He was, however, with his ship when she was heavily engaged at the battle of Jutland, being mentioned in dispatches. In 1918 Prince Albert was transferred to the Naval Air Service, taking his pilot's certificate in 1919.

He then went up to Cambridge for a course of study in history and economics, the functions of government, and the meaning and quality of citizenship. During this time he also acquired an interest in several branches of mechanics.

From the days when he played football and cricket in his holidays against village teams at Sandringham and Windsor, he had always been an enthusiast for sport, he hunted and played polo, had inherited some of his father's skill in shooting, and played tennis sufficiently well to enter for the Wimbledon men's doubles, 1926.

Created Duke of York in 1920, Albert soon gave evidence of his interest in social service by accepting the presidency of the Industrial Welfare Society. In this capacity he has visited factories and workshops and mines all over the country. A lighter, though no less important aspect of this promotion of mutual understanding is shown in the foundation (1921) of the annual Duke of York's holiday camp, held

first at New Romney and later at Southwold. Here some 400 boys, from factory and mine and public school, spend a week in comradeship. The Duke followed the fortunes of his camp with keen interest, spending a happy and informal day with the boys each year. His position as president of the National Playing Fields Association from 1925 onwards afforded him even wider scope for the enthusiasm which had shown itself in the foundation of the camp.

In April, 1923, the Duke married Lady Elizabeth Bowes-Lyon (born 1900), youngest daughter of the Earl and Countess of Strathmore (See Elizabeth, Queen Consort). She was of the Scottish blood royal, an ancestor having married the daughter of the Scottish king Robert II in 1376. The natural charm of the "smiling



KING GEORGE VI

For

King George VI, like his father, was trained for the Royal Navy, and served in H M S Collingwood at the battle of Jutland, being mentioned in Admiral Jellicoe's dispatches. In this photograph His Majesty is shown in the undress uniform of an Admiral of the Fleet.



Duchess " soon won her the affection of the people, and this affection was extended further to her children, the Princess Elizabeth Alexandra Mary, now her presumptive to the British throne (born on April 21, 1926), and Princess Margaret Rose (born on August 21, 1930) (See the article on Elizabeth and Margaret Rose, Princesses)

In 1927 the Duke and Duchess undertook a Dominion tour which included the West Indies, all parts of Australia, New Zealand, and Tasmania. The culminating object of the voyage was the opening of the Commonwealth Parliament House at Canberra. On returning home, the Duke declared that "at every place we visited we have been deeply moved by the demonstrations of affectionate loyalty to the throne with which we have been greeted"

Save for brief visits to various European countries, including a visit to the Colonial Exhibition in Paris in 1931, and to the International Exhibition at Brussels in 1935, King George and Queen Elizabeth have spent the last few years in the British Isles, engaged in an almost ceaseless round of public ceremonies. Modest, earnest, sincere, and admirably conscientious, by years of quiet, painstaking work the King has earned a special place in the regard of his countrymen. He was crowned May 12, 1937

### Georgia, U.S.A. STATE

In 1540 De Soto and his followers crossed Georgia in their search for gold, but it was nearly two centuries later that the first European settlement was made, Georgia being the last settled of the original 13 British colonies. In 1732 a number of benevolent gentlemen in London obtained from the king a charter to found a colony for the poor of Great Britain and the persecuted Protestants of Europe. They called the colony "Georgia" in honour of King George II. In 1733 James Oglethorpe, who had been selected as governor, sailed up the Savannah River with 116 immigrants and founded the city of Savannah, which he named after the river. In 1734 a band of Lutheran refugees, the "Salzburgers," were attracted to this already prospering colony, and settled there.

Some of the most important battles of the War of Independence were fought on Georgia's soil. Under the Federal Constitution the state increased steadily in wealth and population. In 1861 Georgia seceded from the Union, and the state took a prominent part in the Civil War which followed.

Georgia extends north to south for 320 miles, and east to west for 253 miles, its area is 59,265 square miles.

Georgia's greatest industry is cotton growing. Maize, which ranks next to cotton in importance,

grows everywhere. Fruit abounds in all sections, and includes almost every kind grown in the United States. Sugar cane, used largely in the manufacture of syrup, is grown over the middle and southern sections. Oats and hay are grown in increasing quantities, while tobacco has recently come to be one of the most valuable crops. Vast forests, which still cover approximately 40,000 square miles, rank next after maize as a source of wealth.

Atlanta (population 270,000) is the capital. Georgia's population is about 3,000,000, of whom just over 1,000,000 are negroes.

**Georgia, ASIA** The independent Georgian Socialist Republic, called also Sakartvelo, forms, with Armenia and Azerbaijan, the constituent republic of the Russian Soviet Union called the Trans-Caucasian Federation. Georgia maintained its own line of kings for more than 2,000 years, until 1801. Then it was annexed to

the vast empire of Russia, to which it had appealed for protection from the Turks. It declared its independence in May, 1918, after the Russian Revolution, and joined the Soviet Federation in 1921. The Georgians are a handsome, athletic race of ancient white stock.

Georgia is on the Asiatic side of the Caucasus Mountains, bordering on the Black Sea. The ancient city of Tiflis (Tbilisi), the capital, has a population of about 519,000. The railway and oil pipe lines from Baku to Batum, chief port of Georgia, pass through Tiflis. Georgia possesses the world's largest deposits of manganese. Most of its inhabitants are engaged in agriculture, producing chiefly corn and other cereals, cotton, fruit, and wine. The forests are rich in valuable



A GEORGIAN BOY

This small Circassian lad keeps up the military traditions of his fiercely-independent ancestors. His uniform is an exact miniature of his father's, complete with silver dagger and cartridge cases.

Photo Florence Farnborough



## GEORGIA

timber, but are commercially undeveloped. Powerful hydro electric power stations are being constructed under the Soviet's industrial re organization plans. Area 26,381 square miles, population about 3,542,000.

**Geranium.** Botanists tell us that the red, white or pink "geranium" plants, whose spicy fragrance scents summer gardens and window sills, are not really geraniums at all, they are pelargoniums. The real wild geraniums of our countryside are called "crane's bills," on account



### GERANIUMS OF TWO KINDS

The meadow crane's bill (above) is one of our loveliest wayside plants, with its handsome, deeply cut leaves and big, blue purple flowers. Although its botanical name is "geranium," it is no relation of the geraniums of our gardens, for they should by rights be called "pelargoniums." You see a cluster of them in the upper picture.

of the shape of the seed pods. They usually have hairy, compound leaves and pinkish or purplish flowers, and like shady places. The finest is the blue *G. pratense*—meadow crane's bill—common by roadsides in many places, and another common species is herb robert (*G. Robertianum*), a plant with dainty little light purple flowers streaked with red, found in damp, shady woods and on old walls. It has a strong smell. The little stork's bill of the related genus *Erodium* is common in dry and sandy places.

## GERMAN

The house plants we call "geraniums"—the pelargoniums—belong to the same family, *Geraniaceae*, but differ greatly from the true geranium in appearance. They are frequently grown in greenhouses and conservatories, and are much favoured for window and vase decoration, and also for bedding purposes. In colour their flowers range from a pure white to a bright scarlet, and between these there are many beautiful shades of pink and cerise. The foliage, too, is often variegated with yellow or white.

**German, Sir Edward (1862-1936)** This popular English composer first made his reputation with the incidental music to "Richard III," which he produced in 1889, the year after he became musical director of the Globe Theatre, London. He was born at Whitechurch, in Shropshire, and educated at Chester, afterwards studying at the Royal Academy of Music. Though a competent violinist, he devoted the main part of his career to composition.

German's music to "Henry VIII," first produced at the Lyceum in 1892, contained three dances which have become very well known. He wrote incidental music to other Shakespearean plays, later turning to light opera, his most famous efforts being "Merrie England," "A Princess of Kensington," and "Tom Jones."

The music of German was influenced by Sir Arthur Sullivan, his master, whose opera, "The Emerald Isle," he completed after Sullivan's death.

Sir Edward German (he was knighted in 1928) was a very unassuming man who, in his later years, was rarely seen in public. But at his death the whole musical world in England paid tribute to his work and his character.



**SIR EDWARD GERMAN**

The music of Edward German is essentially English in character, and his opera "Merrie England," composed in 1902, captured the spirit of Elizabethan times. German was knighted in 1928, and is here seen in Court dress.

Photo: Landolt

# The GERMAN LAND and Its PEOPLE

*A land of great natural beauty is Germany and one on which a geography lesson can be made an interesting travel talk, for all types of scenery and industry find their home there*

## Germany.

Where may one find a land that is possessed of greater natural resources, of such charming scenic beauty, of more splendid scientific, industrial, and artistic achievement? And where, alas, is there a people who have done so much to impair the well-being of the world at large than the inhabitants of this same Germany? Their docility to unprincipled leaders has proved calamitous by twice plunging the world into devastating wars within a quarter of a century.

History can show few more dramatic episodes than the speedy creation of the German Empire, followed by its spectacular collapse in 1918 at the end of the World War. Scarcely less remarkable, however, was the readiness with which the defeated German people built a new and different political structure on the ruins of the old and succeeded in recovering a large measure of their former prosperity in one generation.

Before the German Empire was shorn by the Versailles Peace Treaty in 1919 the map of Germany was not unlike a helmeted giant sprawling on all fours. Prussia, occupying two thirds of the whole area, made up the body and head. Its ore and grain bearing province of Silesia formed the creeping arms and hands. Now the giant's helmeted head is cut from the body, for East Prussia is severed from the rest by the "Polish Corridor" to the Baltic Sea. Other losses, amounting to nearly 15 per cent, have reduced the country from an area of about 209,000 square miles to little more than 180,000.

Let us begin our visit to this land by flying swift and high from south-west to north-east. A green and smiling country lies below us. It stretches from the Alps and the Bohemian mountains north-west to the Baltic and the North Sea, and from Belgium and Luxemburg on the west to Poland on the east.

**Extent**—Area of German Republic, about 180,000 square miles. Population about 66,000,000. Latitude, 47° 16' to 55° 53' N. Climate, continental, with cold winters in north-east, milder in west, Rhine valley warm summers with brilliant sunshine.

**Rivers**—Danube, Rhine (Moselle, Neckar, Main, Ruhr tributaries), Ems, Weser, Elbe (Saale tributary), Oder and Vistula.

**Mountains**—Bavarian Alps, Bohemian Forest, Erzgebirge ("Ore Mountains"), Sudetes, Black Forest, Thuringian Forest, Taunus, and Harz Mountains.

**Products**—Iron and steel manufactures, textiles (cotton, woollen, linen, and silk), beet sugar, chemicals, electrical goods, pottery, wine and beer etc., wheat, rye, oats, barley, hops, potatoes, timber, live-stock, and dairy products, herring and other fish, coal, iron, lead, copper, potash, etc.

**German States** (in order of area)—Prussia, Bavaria, Württemberg, Mecklenburg, Baden, Saxony, Thuringia, Hesse, Oldenburg, Brunswick, Anhalt, Saar, Lippe, Hamburg, Schaumburg-Lippe, Bremen.

**Chief Cities**—Berlin (capital over 4,000,000), Hamburg (over 1,000,000), Cologne (Köln), Munich (München), Leipzig, Essen, Dresden, Breslau, Frankfurt-on-the-Main, Dortmund (over 500,000), Düsseldorf, Hanover, Duisburg, Hamborn, Nuremberg (Nürnberg), Stuttgart, Wuppertal (over 400,000), Chemnitz, Gelsenkirchen, Bremen, Königsberg, Bochum (over 300,000), Magdeburg, Mannheim. (*Above details are prior to the annexation of Austria*.)

Like a silvery ribbon the Rhine, the king of German rivers, flows from Switzerland to the sea. It is navigable as far as Basle and is connected by canals with both the Danube and the Rhone, so that commerce from its shores can pass equally to the North Sea, the Mediterranean, and the Black Sea. Its falls at Schaffhausen are the largest and most picturesque in Europe. Palatial steamers bear travellers down its stream, past historic cities of the Middle Ages, past bustling seats of modern in-

dustry and commerce, to sunny vineyards on terraced hills, and innumerable heights crowned with ruined castles. The middle Rhine and the valley of the Moselle, its chief tributary from the west, produce some of the finest wines in the world. Innumerable legends, folksongs, and romantic tales cluster about this lordly river.

Northern Germany unfolds itself before us as a fairly uniform plain, a part of the great lowland that extends from the vast expanse of Russia to the English Channel. Across it numerous large rivers flow northward—the Ems, Weser, Elbe, Oder, and Vistula—all with large seaports at or near their mouths and navigable for steamboats either entirely across, or far into, the heart of Germany. An enormous amount of commerce, especially of bulkier goods, is borne on these rivers and on the tributaries and 1,500 miles of canals which connect them. Many German rivers rise in Austria, Czechoslovakia, or Poland, and cross Germany to the sea.

The German plain is narrowed in the west by the Thuringian hills and the Harz Mountains. Like all the mountains of Germany proper, these are old worn down ranges and are forest-covered. In places, also, low hills parallel the sandy shores of the Baltic. Forests of beech, spruce, and pine, and numerous marshy lakes are found in the east, and moors near the western coast.

## GERMANY

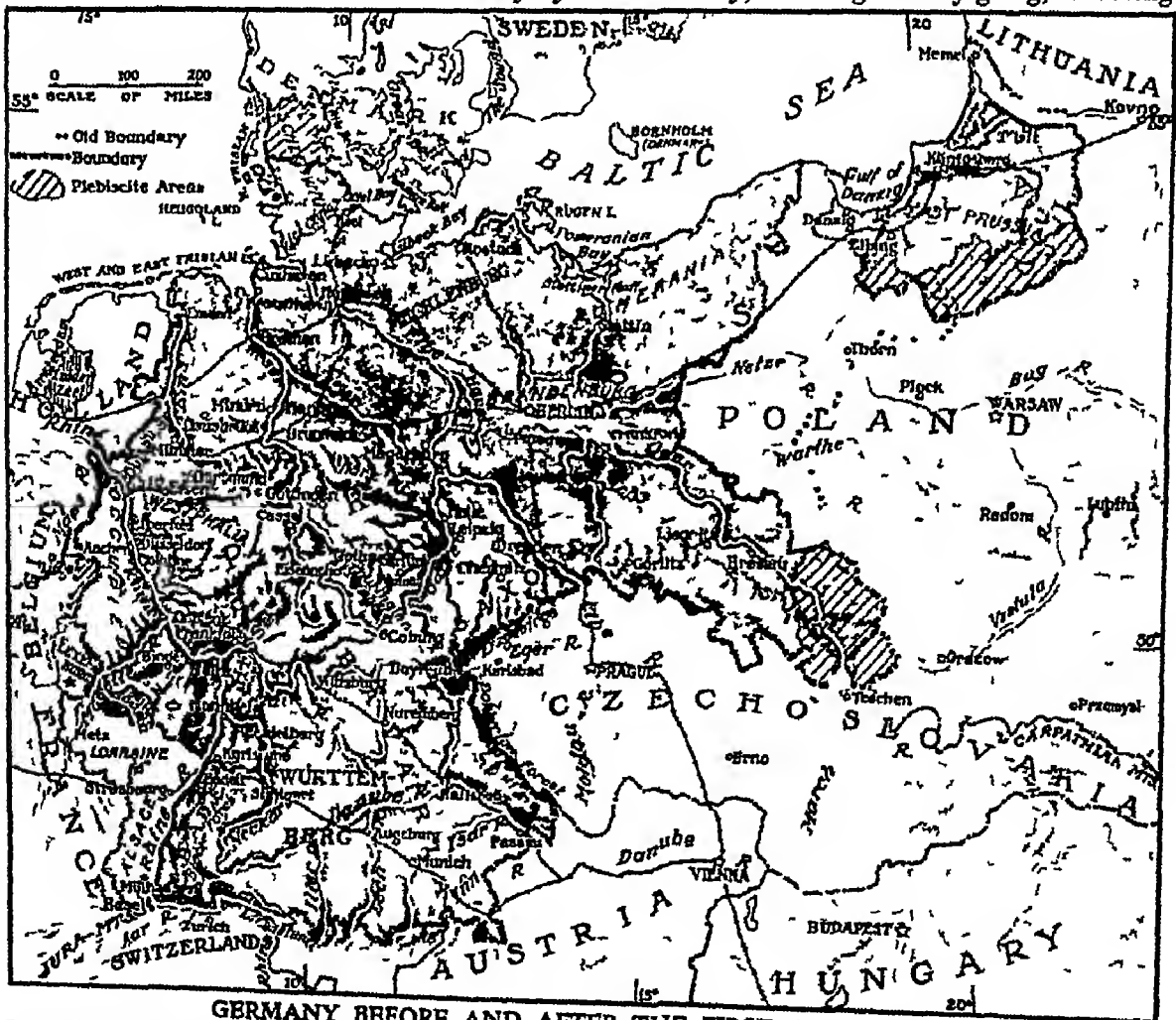
The sandy soil and harsh climate of the northern plain are unfavourable to agriculture, but science and patient labour produce on the great estates of Prussia and Pomerania bountiful crops of rye, barley, oats, sugar-beet, and potatoes—potatoes by the millions of bushels, for these are a staple food of the German people. Indeed, in one small German town (Offenburg, in the Black Forest) stands a statue erected to Sir Francis Drake, as the man who first introduced this important tuber to Europe. Horses, cattle, sheep, and pigs are also raised extensively, while the turf cut from the Lüneburg moorlands supplements the coal and lignite from more favoured regions.

In this northern half—the essentially Prussian part of Germany—lies Berlin, perhaps the most modern of European capitals, at the centre of the nation's transport and commercial system.

Only three important ports—the quaint Hanseatic town of Lübeck, humdrum Stettin, and Königsberg—remain in the possession of Germany on the Baltic today, for Danzig and Memel are in territory taken from Germany by

the Treaty of Versailles. Facing the North Sea however, are the still thriving maritime cities of Bremen and Hamburg. The former naval harbour of Kiel also stands at the Baltic end of the great canal which cuts across the neck of Jutland. Excepting Kiel, all these German maritime cities are river-mouth ports. Ship building and fisheries are among the most important industries in these regions.

Finally we shall notice that this northern plain, owing to its lack of protecting mountain barriers, lies open to easy invasion. Hordes of barbarian Goths, Slavs, and Tartars swept across it in far off ages. More recently it has been the battle ground for the armies of Sweden, Spain, and France in the devastating Thirty Years' War, for the conquering hosts of Napoleon, and the advance and retreat of Austrian and Prussian swarms. In self-defence, therefore, Prussia was compelled to become a military power with movable frontiers, and war and conquest as national industries. The tragedy of Germany was the later conversion of all Germany, including the easy-going, art loving



This map illustrates certain "international crises" that have occurred in recent years, and whose repercussions led to the Second Great War. They arose from the territories which were taken from Germany by the Peace of Versailles. Near the bottom left-hand corner are Alsace-Lorraine, surrendered to France, the Saar, the people of which voted for a return to the German Reich in 1935, and the "Rhine Frontier Zone," remilitarized by Herr Hitler in defiance of the Treaty

## GERMANY

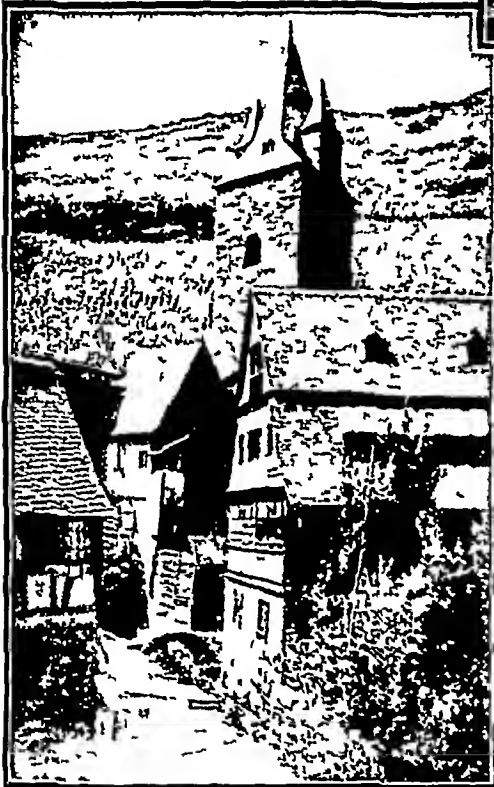
philosophic south and west, to the hard Prussian doctrine that "might is right."

Westward of the mountain-rimmed countries of Bohemia and Moravia lie the ancient homelands of German culture—Bavaria and the regions still sometimes known as Swabia and Franconia. Seven hundred years ago while the original Prussians beyond the Vistula were still heathen Slavs, Franconia and Swabia were great and flourishing duchies, the bases of leading branches of the German folk, from which sprang illustrious lines of emperors. As states they have long disappeared from the map, but Baden,



### THE CHARM OF THE OLD GERMANY—

Quaint Old World customs and places lured the tourist of former years into the heart of Germany. Above, you see Cochem Castle on the Moselle River. Once the home of archbishops it was destroyed by the French in 1689 but later rebuilt. All the beauties of the Rhineland are found in the picturesque village of Bacharach. "Painter's Corner" is seen at the left.



Württemberg, and Hesse occupy today parts of their former territory.

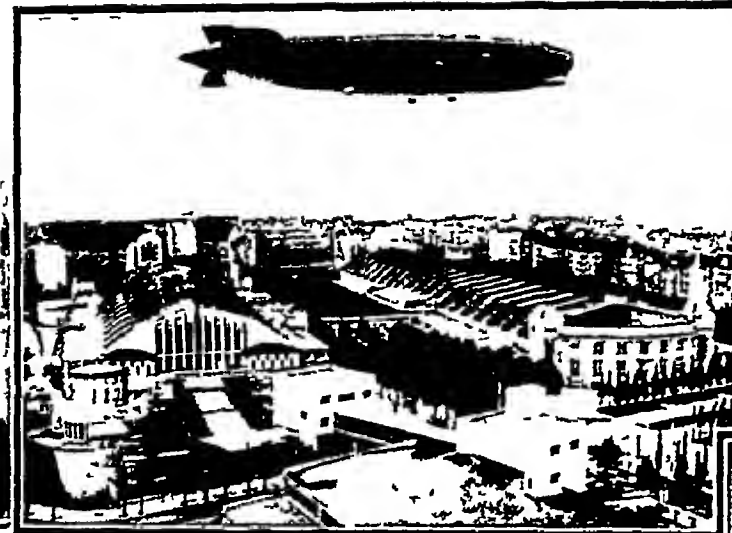
How welcome is the change from the Prussian north to the friendlier and more picturesque land and people of the south of the Rhineland! Instead of monotonous level plain, we have fertile valley, wooded upland, and occasional rounded mountains, and everywhere ruined castles, quaint old cities rich in historic and artistic memories, and peasant costumes for men and women gay with colour and silver and velvet ornaments. To the agricultural products of the north we here add wheat, flax, and tobacco. In Bavaria grow the hops used in the famous German beer, and in the Rhineland are wonderful vineyards. And everywhere we see churches and shrines, for South Germany and the Rhineland were as staunchly Catholic as the north was Protestant.

Coming from France the traveller finds Strasbourg no longer a German but a French city, for Alsace Lorraine was restored to France by the Peace Treaty. Across the frontier, in the elbow of the Rhine, lies the former grand duchy of Baden—famous alike for its picturesque Black Forest and for Heidelberg, the seat of a great university and a fine ruined castle. The former kingdom of Württemberg, with its castle crowned hills, is



Here are students of the ancient university of Würzburg—founded in 1582 and famous for its medical training. Heavy work was a woman's lot in old Germany as you can see from the picture at the right. Characteristic of this era also were the gay costumes worn on all fête days.





#### AND GERMANY AS IT IS TODAY

In striking contrast with the quaint charm of the old Germany we see, above, a modern note as a giant dirigible soars over Berlin. Throughout the land this modern spirit in design and architecture is finding expression in new buildings such as the Palace of Arts right, in Düsseldorf, remembered as the boyhood home of Heine who was once Germany's beloved poet

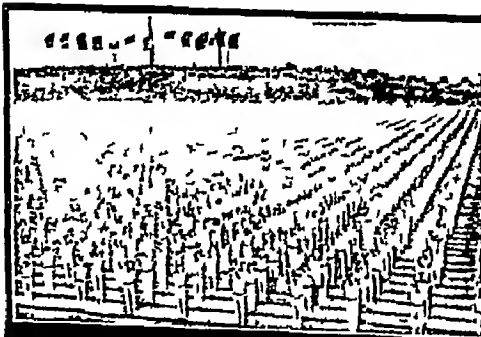
filled with memories of old Swabian days, but its capital Stuttgart is a flourishing modern city.

These wooded highlands of the south raise the total of Germany's forest area to one fourth of the whole land. Beech, oak, pine, spruce, and birch are among the most important growths. The Government strictly controls the forests, and no one may destroy a tree without planting another. In some parts of Bavaria the wood industries are almost the sole resources of the people. On the Rhine great timber rafts are frequently met with floating downstream to Mainz and other furniture making and wood using cities.

In the former kingdom of Bavaria the traveller finds not only the best of old time Germany alongside the products of modern art, science, and industry, but also the loveliest scenery of that country. (See Bavaria) Here only does Germany touch the Alps, for the Austro-Bavarian boundary runs along the ridge of the Northern Tirolese or Bavarian Alps, and in the distance are seen the far off majestic peaks of the Vorarlberg. Thoroughly Alpine are the little Bavarian towns of Garmisch and Mittenwald, and the numerous upland lakes—Chiemsee, Starnberger See, Ammersee, and the rest—are altogether lovely. The Zugspitze (9,738 feet),

57 miles south of Munich, is the highest peak in Germany. In this Bavarian country, also, are unique castles like Neuschwanstein and Linderhof, of modern build, but medieval in appearance; these were the extravagant work of Bavaria's mad, romantic unhappy kings, Ludwig and Otto.

Bavaria's cities, too, may well be her pride. The art-loving capital of Munich, situated beside the Isar, on a lofty plain some 25 miles north of the foothills of the Alps, has a charm lacking in Berlin, while as for



German athletes in a Turnfest at Cologne and a girls' dancing class in Hanover





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Augsburg, Nuremberg, Regensburg (Ratisbon), and Passau, each has an interest all its own. And where can Wagnerian opera be heard so well as at Bayreuth, or religious drama seen to better advantage than at Oberammergau?

Augsburg dates from Roman days, and bears the name of the Emperor Augustus. It is filled

how, in the terrible days of the Thirty Years' War, the burgomaster delivered his people from the wrath of the victorious general Tilly—by drinking without once stopping for breath a tremendous flagon of excellent Rothenburg wine!

Between these two older Germanies of the north and of the south lies a third, the gigantic

growth of the last half-century—the "black" industrial region of central Germany. It comprises three chief areas—the Rhine-Westphalian region lying on both sides of that river north of Cologne, the Saxon districts northward of Bohemia, and Silesia. About Berlin also is an extensive industrial region, but it lacks the immediate coal facilities which are the chief advantage of each of the other two areas.



with memories of trans-Alpine commerce with Italy in the Middle Ages, and here may still be seen the house, rich with its frescoed exterior, of the Fugger merchant prince who lent enormous sums to the Emperor Charles V. A well-known painting pictures for us the scene when the head of this great banking family astonished the emperor by laying on the fire the promissory notes which Charles had signed, thereby releasing him from the debt. Picturesque Nuremberg is so important that it is described separately.

Forty miles to the west of Nuremberg lies the little town of Rothenburg-on-the-Tauber, with city walls, town hall, and ancient churches and houses much as they were 500 years ago. It is one of the best preserved medieval cities in existence. Every year a play called "Der Meistertrunk" is given here showing



### OLD WAYS IN GERMANY'S SOUTH

Traditional customs and clothes survive most commonly in Southern Germany, where German life and people are simplest and most charming. The upper photograph shows a brass quartette from Ellwangen, Württemberg, at the Ulm festival. In the lower illustration are peasant girls from Nordlingen, Bavaria, in their national costumes. Among such people Herr Hitler has his country home at Berchtesgaden.





### SUNDAY CLOTHES IN GERMANY

Nowhere in Germany are the Sunday clothes worn by the peasants more picturesque than in the Black Forest district of the south west. Every valley has its own style and the head dresses are particularly varied. This girl of the Elz Valley wears a scarlet topper held in place by broad ribbons and her gown though of a more sober colour is obviously designed for holiday wear.

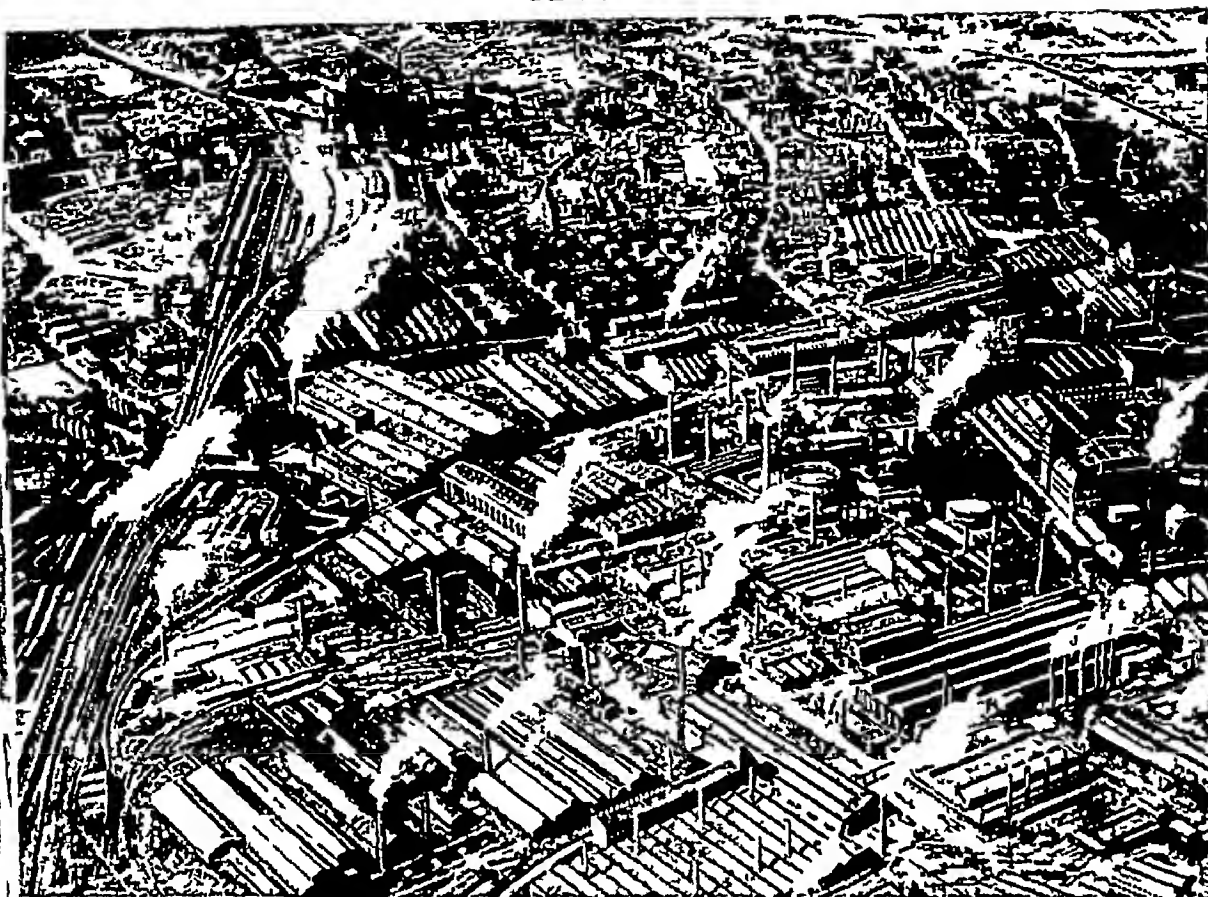
(John George Huet)



### AWHEEL IN BILLOWY CLOTHES

The girls hail from the Spreewald near Berlin and though on wet days they may be dressed in smart modern clothes at holiday time they delight to wear the old Wendish costumes. Even in the voluminous skirts of their peasant dress they manage to make their way to the fete they are attending on bicycles.

By Geo. Hockett



#### ONE OF THE GREAT GERMAN STEEL WORKS

The Krupp steel works at Essen are among the largest in the world. The Versailles Treaty forbade Germany to make any more guns or munitions, and for a time the Hindenburg shops, largest in the plant, made locomotives, the former turret-gun shop built huge Diesel engines, and the howitzer shop turned out motor trucks. But nowadays, of course, the works have returned to their former trade of making the implements of death.

Even today, after losing the rich coal-fields of the Saar basin to France and part of those of upper Silesia to Poland, Germany possesses mines of coal and iron more extensive than any other European country except Great Britain. In addition there are extensive zinc, copper, lead, and salt deposits and some gold and silver. Formerly Germany possessed almost a monopoly of the world's supply of potash, and even today her mines at Stassfurt (in Prussian Saxony) are the chief source of those salts, so important for fertilizers and the industrial and medicinal chemical industries.

The Ruhr coal field, which is the richest in Europe, supplies the secret of the great Rhine-Westphalian industrial development. Its coal feeds the fires of innumerable blast-furnaces, including the vast Krupp iron works at Essen, the seat of Germany's manufacture of monster cannon, munitions, and armour plate, and also of locomotives, marine engines, and other heavy manufactures. Solingen is renowned for its knives and cutlery, Iserlohn for needles. Near by is the cotton manufacturing city of Wuppertal, "the German Manchester," which includes the former twin cities of Barmen and Elberfeld. On the left bank of the Rhine, in the region under Allied occupation after the World

War, are Krefeld, the chief seat of the German silk and ribbon manufacture, and Düsseldorf, the banking centre of the district. The factory cities show few slum districts. Today German city governments and working class legislation are regarded as among the most enlightened in the world.

The industrial district of Saxony is similarly based on the Saxon coal-field. From Chemnitz and Zwickau come German stockings, knitted underwear, and other goods made from imported cotton. Fine wools grown in Saxony and Silesia make these regions great centres also for woollen textiles. The clay deposits at Meissen, near the Saxon capital, Dresden, render possible the famous "Dresden ware." Many of the chemical, dyestuffs, and electrical industries are situated in this region. Leipzig, seat of a great university, is also one of the largest book-publishing centres in existence.

Most of this industrial strength was developed after 1870, aided largely by three factors. First was Germany's natural advantages—coal and iron conveniently near each other, many other valuable minerals, and a good location for trade by land and sea. Second was the hard-working, obedient character of the German people. Third was the inspiration derived

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from the successful wars, under Prussian leadership, which brought the German Empire into being in 1871. This made Germans willing to accept rigid Prussian discipline and autocratic government supervision of private industry, and Germany then rapidly completed her extensive

system of railways and canals, while capitalists with government co-operation, quickly built giant industries. In doing so, German industry made extensive use of science, particularly chemistry, and German education was largely shaped to meet state and industrial needs.

## GERMANY'S PLACE in the HISTORY-BOOK

*Not until within living memory was Germany a united country, with one boundary and one government. In this article is chronicled her slow development towards unity from a mass of scattered and often hostile states.*

**Germany, HISTORY OF** As far back as we have any record, Germans have inhabited this land, but their ancestors probably came from the grass lands of southern Russia. Romans and wandering German tribes fought one another as early as 113 B.C. While Julius Caesar was governor of Roman Gaul, which extended to the Rhine, he drove back two German tribes who had settled west of that river (55 B.C.).

In the year A.D. 9 a Roman army was entrapped and destroyed by a German chieftain named Arminius (Hermann) in the Teutoburg Forest in north western Germany. About a century afterwards the Rhine and Danube were definitely established as the boundary of the empire. Their upper courses were connected by a frontier wall of earth and stone, which ran over the hills, valleys and rivers of Swabia near the junction of the river Main with the Rhine.

The Roman historian Tacitus (A.D. 98) described the Germans as a rough barbarian people, tall of stature, with fair complexions and blue eyes. They lived in rude villages in their gloomy forests, wore garments of skins, and spent their time chiefly in war and the chase.

### Rise of the German State

Two hundred years later the Germans—now formed into great groups or nations called Goths, Franks, Frisians, Saxons, Vandals, and the like—began to press into the weakened Roman Empire. When the period of the migrations was ended, the Roman Empire had fallen in the west. Most of the barbarian conquests were absorbed into the kingdom of the Franks, which reached its height under Charlemagne (q.v.). The break-up of the Frankish Empire in the Partition of Verdun (A.D. 843) marks the real beginning of both France and Germany as separate states.

Between the two countries lay a middle strip called Lorraine, which at this time extended westward from the Rhine to the river Scheldt and from the Vosges Mountains to the North Sea. For a thousand years this region was the object of conquest and the seat of European wars, and in 1914 Germany possessed about one-third of it. On the east Charlemagne's effective empire had extended only to the Elbe and its tributary the Saale, beyond which lived

Slavic tribes. The eastward extension of German rule to the Vistula and Memel rivers, with accompanying German colonization at the expense of the Slavs, was the work of another ten centuries.

The conversion of the Germans to Christianity was achieved by Irish monks and then by the Englishman, St. Boniface (q.v.), the "Apostle to the Germans." The Saxons of North Germany, however, remained heathen until the time of Charlemagne.

### Emperors of the Middle Ages

For several hundred years after 843 Germany was divided into a number of great "stem duchies," each the home of a separate stem or branch of the German people. The chief of these duchies were Bavaria, Swabia, Franconia (on the middle Rhine and its tributary the Main) and Saxony (from the Ems to the Elbe, north of Franconia). The Franconian duke was the first to become German king after the ending of Charlemagne's line (911). Then for five generations the Saxon dukes wore the crown. The greatest of this line was Otto I, the Great (912-973), who revived Charlemagne's empire. Following the Saxon kings the Franconian (or Salian) house again ruled. In its time the empire was convulsed by a great "Investiture Conflict" between Church and State, led by the Emperor Henry IV (1050-1106) and Pope Gregory VII (Hildebrand), and their successors. After the Salian emperors came the Hohenstaufens, so called from their ancestral castle in Swabia. Frederick I, called Barbarossa or "Red Beard" (c. 1124-1190), and his grandson, Frederick II (1194-1250), were the most important of the Hohenstaufen emperors.

Feudalism and the attempt to rule Italy along with Germany broke up the stem duchies into a thousand or more fragments. Everywhere arose robber barons, who ruled from their hill-top castles by *Faustrecht* ("fist law"). Italy, as was said by Rudolph of Hapsburg (1218-1291), was the first of his house to become emperor, was "the den of the lion," with many tracks leading in and none coming out. So Germany remained an elective monarchy, weakened by its connexion with Italy, while France, England and Spain were building up strong national kingdoms based on the principle of hereditary rule.

## GERMANY: HISTORY

But the strength that ebbed from the German kingship flowed in the hereditary princely states. The Golden Bull (1356) of Charles IV definitely fixed the right to elect the emperor in the "Seven Electors"—the archbishops of Mainz, Cologne and Treves, the Margrave of Brandenburg, the Elector of Saxony, the Count Palatine of the Rhine and the King of Bohemia. By confirming the powers of these and other states and "free cities," Charles IV "legalized anarchy and called it a constitution."

Even Charles V (1500-1558), who in addition to Germany ruled the Netherlands, Spain, Austria, Naples and Sicily, and large parts of the New World, was unable to put down the Reformation started by Luther, and one of the chief reasons was the support given to it by the rulers of important German states. The terrible Peasants' War of 1525, in which the people of Swabia and Franconia sought to free themselves from the bonds of serfdom, only riveted their chains more firmly. The great religious struggle called the Thirty Years' War (1618-48) weakened the central power still further.

Thenceforth the head of each of the several hundred German states was practically an absolute ruler, and the Hapsburg emperor was a mere figure head, without power save in

Austria and his other hereditary lands. Disunited Germany was depopulated, commerce almost destroyed, and the people burdened with heavy taxes to support the incessant wars.

But the latter part of the 18th century brought promise of better things. Frederick the Great increased his kingdom of Prussia at the expense of Austria and Poland by most unscrupulous war and statecraft, but he made of his possessions a strong well ordered state. He thus prepared the way for a closer union of Germany, under a new and stronger headship than that of Austria.

The wars waged against Europe by Revolutionary France and Napoleon I helped, though again Germany was left trampled and bloody in the wake of battle. The crushing defeat of the Prussians at Jena (October 14, 1806) compelled a reorganization of that kingdom, by which serfs were set free and a beginning made of the Prussian military system based on the principle of universal service. The mockery of the title "Holy Roman Emperor" was also ended when Francis II resigned it and became simply Emperor of Austria (1806).

After the fall of Napoleon the Congress of Vienna (1814-1815) grouped the German states—now reduced from several hundreds to 39, including Austria—into a formless German



### EMPEROR VERSUS POPE: HENRY IV UNDER AN INTERDICT

The Holy Roman Emperor Henry IV is here seen trying to beg a night's lodging for himself and his men at a monastery. But the monks know that Pope Gregory VII has outlawed him from the Church, and will not let him enter. Henry's soldiers are about to attack the monks, but Henry restrains them, knowing that the only way to rally his followers and get back his power is to ask the Pope's pardon and gain readmittance into the Church.

*From a painting by C. F. Lessing*



## GERMANY HISTORY



### MODERN GERMANY'S FIRST EMPEROR ENTERS BERLIN IN TRIUMPH

This is how Berlin celebrated Germany's victory over France in 1871. The famous Brandenburg Gate, seen above, was festooned, and flags and banners were everywhere. The old Emperor, aged 74, once delicate but now hale and upright, received an ovation, and you see him here accepting the victor's crown of laurels from the leader of a troop of lovely girls. Like many another German leader, he was fanatically fond of war, and in this hour he felt himself justified.

*from the painting by Camphausen Berlin Photographic Co*

**Confederation** Its head was a diet or assembly composed of delegates appointed by the sovereigns, which met at Frankfort on-the-Main.

When the wars of democratic revolution again burst over Europe in 1848, the Liberals of Germany rose in rebellion and demanded democratic government and a strong and united Germany. But when the German Imperial crown—with Austria left out—was offered by them to King Frederick William IV of Prussia, he contemptuously refused it.

The actual creation of the new German Empire was the work of Bismarck (qv). For years he was Prussian delegate to the Frankfort diet, and so was in the thick of Austrian and Prussian rivalry for the German leadership. He believed that only on the field of battle—by "blood and iron"—could that issue be settled. By skilful manoeuvring Bismarck brought about war with Austria in 1866. Prussia's rival was defeated at Sadowa (Königgratz) and forced to submit to a reorganization of Germany which excluded Austria. The states of Hanover, Hesse-Cassel, Nassau, and the free city of Frankfort, which had supported Austria, were ruthlessly annexed by Prussia. The other German states north of the river Main then united with Prussia in a North German Confederation (1866-1870). South Germany was left out, for Bismarck knew that it must ultimately join unless France obstructed his plans.

Four years later Bismarck tricked France also into declaring war, in which she was crushingly defeated and Paris taken. France was forced to pay an indemnity of £200,000,000, and to cede Alsace Lorraine to Germany. The enthusiasm aroused brought the South German states into the Prussian organization. It was completed by the proclamation at Versailles (January 18, 1871) of the German Empire, with the King of Prussia as Emperor (Kaiser).

There was a popularly elected Reichstag, or legislative chamber, but the real power lay with the Prussian war-lord as chancellor. The chancellor, who was at the head of the administration, was responsible only to the Emperor.

Under the skilled leadership of Bismarck as chancellor, in the reigns of the Emperors William I (1871-1888) and Frederick III (March-June, 1888), the new empire grew rapidly in vigour, industrial prosperity and power. The beginning was made of a colonial empire which ultimately included about 1,000,000 square miles in Africa (Togoland, Cameroons, German SW Africa, German E Africa) and 100,000 square miles in China and the Pacific islands.

Two years after the accession of the Emperor William II (born 1859), Bismarck was abruptly dismissed by the impetuous young Kaiser, whose many aggressive demands for "a place in the sun," led up to the World War of 1914-18, which ended the empire and lost it all its colonies.

## GERMANY: HISTORY

Germany's prosperity was destroyed by her leaders' reckless 1914 policy of "World power or downfall!" The Peace Treaty nearly five years later condemned her to pay huge indemnities, surrender her navy, limit her army to 100,000 men, lose Alsace Lorraine, her Polish territories, part of Schleswig, and all her colonies, while her territory on the west bank of the Rhine was occupied by the Allies for 15 years. Just before the signing of the Armistice (Nov 11, 1918) the Kaiser fled to Holland, the rulers of the states abdicated or were deposed, and republican governments took their place. A "Spartacist" revolt broke out in January, 1919, but was suppressed by the moderate Socialist provisional government.

A constitution came into effect in 1919 providing for a Republic under a President and a responsible Cabinet, and the popularly elected Parliament (Reichstag) was strengthened. But the Socialist regime failed to solve the difficulties with which it was faced. Unemployment was rife, risings broke out, the mark fell, reparation payments were not maintained, and French troops occupied the Ruhr (1923). Improvement attended the formation in 1923 of a ministry of the Centre party, in which Gustav Stresemann as Foreign Minister initiated a policy of co-operation with the Allies. This ministry restored the currency by introducing the Reichsmark, accepted new reparations plans, signed the Locarno peace pact (1925), and joined the League of Nations (1926). The first reparations plan (the Dawes Plan of 1924) provided for a graduated system of annual payments and the supervision of Germany's financial and industrial affairs. The second (the Young Plan of 1929) fixed amounts to be paid annually over 37 years. Germany being left in control of her economic affairs.

Another economic crisis, however, arose in 1929. Ministries fell, and the Nazi movement, that of the "Nationalsozialistische Deutsche Arbeiterpartei" (National Socialist German Workers Party), grew in power under Adolf Hitler (qv), an Austrian by birth.

Following the death in 1925 of the first President (Friedrich Ebert) and the death in August, 1934, of his successor (the veteran Field-Marshal Paul von Hindenburg), Hitler, who had been Chancellor since January, 1933, combined the offices of President and Chancellor, adopted the title of *Fuhrer* (or Leader), and became a virtual dictator.

Hitler's accession to absolute power marked the beginning of the "Nazi Revolution," whose goal was the "totalitarian state," that is, a nation entirely without factions. The Nazis proceeded to suppress all opposition, whether from political parties, from labour, from industry or from the Churches. Such democratic institutions as the Reichstag, the state governments, independent courts and limited governmental powers were abolished or curbed.

As the leader of a united nation, Hitler proposed to make it strong for war, so that he



### WHEN THE BRITISH WERE IN THE RHINELAND

After the World War the Rhineland was occupied by the troops of the victorious Allies. This photograph was taken in the Cologne district and shows the barbed wire boundary guarded by British "Tommies" with fixed bayonets. Some Germans are having their papers examined before they can enter it. The last British troops withdrew in 1929. In 1936 Germany alarmed the chancelleries of Europe by remilitarizing the Rhineland.

## GERMANY HISTORY

could enforce demands for more territory and return of colonies, and exercise a powerful influence in world affairs. The Nazi programme offered the people not so much betterment of their own lot as participation in the national glory by joining one of the numerous military or semi-military bodies within the Nazi party such as the Brownshirts or the Blackshirts.

As this programme was realized step by step, events crowded one on another. Jews, denied all participation in the new "all-Aryan" state, were cut out of the nation's economic life as well. Anti-Nazis and dissenting party leaders alike were slaughtered in the Nazi "blood purge" of June 30, 1934. Labour unions were merged into the Nazi "Labour Front."



*International Graphic Press*  
**THE FUEHRER ENTERS PRAGUE IN TRIUMPH**  
Hitler is here seen entering Prague (March 1939), the chief city of Bohemia and former capital of Czechoslovakia.

youth movements were taken over by the "Hitler Youth." Universities, Churches, and farm organizations were brought into line, or "co-ordinated," although the Church bitterly resented State interference. Press, stage and wireless were placed under the strict censorship of a propaganda minister, Dr Goebbels. New People's Courts, with judges appointed by Hitler, tried the many crimes construed as "high treason" and sent political prisoners to concentration camps. In 1936 a new legal code, subordinating citizens' rights to the aims of the nation, established severe punishments for many "crimes against the state," while the States of the Reich were reorganized, each with a Governor responsible to the Leader.

Germany's war power was renewed, in violation of the Versailles Treaty. Factories turned out guns and ammunition and military planes, shipyards launched new warships. Compulsory two year military service was

introduced. The demilitarized Rhine provinces were occupied and fortified, and international control of Germany's great rivers repudiated.

Backed by an apparently united people, as shown by the referendums of 1934 and 1936, and the almost unanimous vote of the Saar in 1935 to return to Germany, Hitler took a constantly firmer stand in world affairs. He withdrew from the League of Nations, denounced the peace treaties, and established a "unity of aim and interest" with Mussolini, thus laying the foundations for a powerful Fascist bloc in central Europe. His other major aims included colonial expansion and increased influence in Austria, Hungary, Danzig and the Balkans. Despite the German Government's agreement of 1936 acknowledging Austria's independence and promise not to interfere in her affairs, on March 13, 1938, Austria was declared a German State and the annexation was confirmed by a plebiscite of the people held on April 10.

Meantime, there had arisen a crisis over the German minorities in the Sudeten territories of Czechoslovakia. This crisis came to a head in September 1938, when war with the Western Powers was only averted by the ceding, at the Munich Four Power Conference, of these territories to Germany. By this annexation of the Sudetenland (in September and October 1938) the population of Germany was increased to 79,600,000 and the area to 234,800 sq miles.

In December 1938 the shooting of an Embassy official in Paris by a Jew was used as an excuse for a new and more terrible "pogrom" of the Jews, for whom life in Germany now

became impossible. Huge fines were imposed on them and the ghetto system of the Middle Ages was reintroduced. In December the "no war" pact signed with Britain at Munich was followed by a similar declaration with France as the co-signatory.

In March 1939, a new Czech crisis gave Germany the pretext to invade Czechoslovakia. Bohemia and Moravia became a vassal Protectorate of the Reich, and Slovakia's declared independence became only nominal. By this action Germany obtained an even greater hold on Central Europe trade and politics with an important advance to the south east.

By this occupation of the Czech provinces of Bohemia and Moravia and of Memel in March 1939, the population was further increased to 86,553,000 and the area to 268,500 sq miles. Prague, Brunn and Pilsen are only three of the Czech cities that fell into German hands, the Reich gaining enormously in industrial resources,

## GERMANY PAINTERS & PAINTING

including the armament works of Skoda and Brunn. She absorbed the Czech Army and Air Force, and imposed Nazi government on her new Protectorate.

Six months later, on September 1st, 1939,

Germany—who had demanded Danzig and a plebiscite in the Polish corridor—went to war with Poland, attacking by land and air at once. British and French ultimatums were followed by declarations of a state of war from those nations.

## A GLANCE at GERMAN PAINTING

*Few Germans have made a name as artists, perhaps because the Teutonic genius is more critical than creative. The most important of those who have achieved distinction in this field, however, are noticed here.*

### Germany: PAINTERS AND PAINTING

The art of Germany, although producing few famous figures, has long been marked by strong national characteristics, and some of these are traceable in the Middle Ages when the first

German painter of note flourished. This was one Wilham of Cologne, the painter of a number of religious works, altar pieces, etc., and contemporary with him there arose in the 14th century a school in Bohemia, which was much influenced by Italian painters, and was therefore less national than the Cologne school. The latter school continued to produce good work, of which the triptych by Stephan Lochner (d 1451) is the finest. In the southern Rhineland there were other artists at work, among whom the names of Conrad Witz (c 1440-c 1447) and Martin Schongauer (1445-1491) are outstanding. In general, all these artists showed strong Flemish influence, but, meanwhile, Albrecht Durer (1471-1528) had begun to work.

Durer, greatest of German artists, was pre-eminently an engraver (see Durer, Albrecht, Engraving), and it is in his engravings that he chiefly shows his German characteristics, namely, a certain brutality, almost coarseness, which most people find unattractive. At the same time there is a continual search for beauty in all his works, and this places them

among the world's masterpieces. As a portraitist Durer holds a high place, but in general his paintings are less important than his woodcuts and copperplate engravings, which are the finest in some ways that the world has known.



MASTERPIECE OF THE ELDER CRANACH

Lucas Cranach the Elder is one of the few German painters to achieve fame outside his own country. His pictures, with their tremendous detail, their stiffness and the slightly grim atmosphere which pervades them, show many of the features generally associated with all German art. The title of this work is "A Rest During the Flight into Egypt."



#### BY GERMANY'S GREATEST IMPRESSIONIST

This fine painting, entitled "Jews Mourning for Kaiser Frederick III," is a typical example of the work of Max Liebermann probably the greatest modern artist Germany has produced, and a notable exponent of the Impressionist manner. This, and a self-portrait, are in the Tate Gallery.

Yet Dürer left few followers, and only a number of unimportant imitators. More in touch with the direct line of German painting are his own master, Michael Wöhlgemuth (1434-1519), a good painter of the Nuremberg school, and Matthias Grunewald, who was active during the end of the 15th and first part of the 16th centuries. He was the painter of some fine religious pictures. Another rather isolated figure is that of Lucas Cranach (1472-1553), one of the best known of all German painters, who is represented in our own National Gallery. Cranach was more notable as a technician than as a creative artist, yet there is something very pleasing in his little "nudes" drawn and painted with consummate skill, though devoid of any feeling. Cranach had several sons, of whom Lucas the Younger imitated his father.

We now turn to two more great artists of Germany, Hans Holbein the Elder (c 1462-1524),

who, though influenced from Italy, did some very fine religious paintings, and his far more famous son, Hans Holbein the Younger (c 1497-1543). These two men came from Augsburg. Holbein (as the son is usually called, for short) was less purely German in his art than Dürer, and for that reason his works have far less of that coarseness noted above. Whether as a painter of religious pictures, as a portraitist, or as an engraver he is a great master. In our National Gallery is his superb Duchess of Milan, one of the finest of all portraits. Holbein is of especial interest to us, not only because of his long sojourn in England, when the glorious series of portrait drawings now at Windsor was made, but also because he had at the same time a great influence on our painting and especially on our miniature painting. (See English Art). Holbein did several fine portraits of Henry VIII.

With Holbein's death German painting ceases to be important for two hundred years. It is not until the 18th century, with Daniel Chodowiecki of Danzig (1726-1801), that we come across another figure, interesting as illustrator and engraver, and commentator on his times.

Anton Raphael Mengs (1728-1779) was the founder of German classicism, working largely in Rome. Actually, his classical compositions are of far less merit than his portraits, especially those in pastel. Of German origin, too, was Angelica Kauffman, though she is usually ranked with the English School. (See English Art). But in

general, German art remained an academic art, producing doubtless many good craftsmen but no figures of any importance.

Two men stand out in the 19th century, the first of these, Adolf Menzel (1815-1905), was a fine engraver, and the illustrator of many books, but is notable chiefly for some paintings which he did about 1842, and in which he appears as the forerunner, in many ways, of Impressionism. Yet in all his later years he never did work of the same type, confining himself to a representational naturalism. In 1884 he was president of the German Academy. Max Liebermann (b 1847), in many ways the most important German painter for hundreds of years, was at first a follower of Menzel's naturalism. Later, influenced by the Barbizon school and by Millet, he did for the German peasantry what that painter had done for the French. (See France Art). He founded the



'Berlin Secession,' and definitely brought Impressionism, which he then (1900) followed to Germany, yet he was also president of the German Academy, 1920-32. He also originated a new German school of deliberately opposite ideals, which came to be known as "Expressionism," and in which that old violence and brutal

its of truly German art again became visible. Its later followers include Kandinsky, and also Paul Klee, who is now regarded as one of the leading and most important representatives of Surrealism working outside his own country. With the present regime, however, art in Germany is again more or less academic.

## The LANGUAGE of GOETHE & SCHILLE

*German language and literature are somewhat similar in history and content to those of England. Here we may read of the great weapon into which her writers welded the somewhat unwieldy German tongue.*

**Germany:** PROSE AND POETRY. At the first appearance of the Germans, or Teutons, in world history, about the beginning of the Christian era, they form three distinct groups with corresponding tongues—the East Germanic or Gothic, the North Germanic or Scandinavian, and the West Germanic, from which originated primitive German, English, Dutch, etc. This primitive German continued to split up into dialects as the tribes settled permanently in various districts, but the chief dialects were the High German of the mountainous region of central and southern Germany, and the Low German of the lowland country in the north. High German prevailed over the dialect of the plains, and it is High German which is the official and literary language of the Germany of today.

German is really a simple and direct language, although it may present a formidable appearance to the beginner. The first difficulty lies in the old "Gothic" characters, in which most German books are printed. This alphabet is simply a variation of the Roman, and any word written in the former can be reproduced letter for letter in the latter script. Next, the beginner is struck by the enormous length of many German words. But these are

due to the ease with which compounds are formed, and when such words are split up in their several parts, they prove not only easy to understand but have a remarkable power of expression. Thus, "Volksschullehrerseminar" looks almost hopeless with its twenty-five letters, until we divide it thus: "Volksschullehrer seminar."

Then we discover, by translating bit by bit, that it means "public school teachers' college."

The formation of such compounds gives an exactness of meaning which is often lost in local English phrases. As when we add to this practice, so common in German syntax, of serving the verb or part of the verb for the whole of the sentence, the reader's attention is suspended until the whole of the thought has been expressed, we realize that German is so valuable a language for scientific description of all things.

The Roman historian Tacitus, writing in the year A.D. 98, tells us that already the German barbarians of that time had a poetry of their own. The warriors advanced to battle singing hymns to Thor, and ever since in German literature there still remain hard sonorous words.

For a long time ancient poetry was unwritten, or, if monuments were carved



**WOTAN'S FAREWELL TO BRUNHILD**

The legend of the Nibelungs is a medieval German heroic epic, and on it Wagner's four most famous operas are based. This illustration from a painting by Dietz, shows Wotan's farewell to Brunhild, the most famous of the Valkyries or warrior maidens, of Teutonic mythology.

and then in the old Runic alphabet on wooden staffs and metal tablets, it was soon lost, or at best remained but fragments

Not until the 4th century do we find a book written in a Teutonic tongue, and by that time it treated, not of the god Thor, but of Christianity. This book was a translation of the Bible made by Ulfilas, the native missionary to the Goths. In order to make his translation, Ulfilas was obliged first to invent the Gothic alphabet by combining Greek, Latin and Runic letters. The tongue of those ancient Goths, as we here find it, possessed much of the beauty and roughness of the German language today.

But, though Ulfilas began the conversion of the Germans to the Christian religion, their poets continued for centuries to sing of the old gods, of Brunhild and Gudrun, and the flying Valkyries, as well as of mighty historic figures such as Attila (Etzel) the Hun. The "Nibelungenlied" of the 13th century is the most famous of these dreams of gods and heroes, and has been the source of much modern German literature.

A lighter note, however, tinkled alongside these resounding epics, the music of the "minnesongs," or love lyrics of knighthood. These dwindled out finally in the wholly mechanical "mastersongs," composed by rule and turned out like factory goods. Yet the same period (15th and 16th centuries) in which these stiff and dreary mastersongs were being manufactured was the very heyday of the delightful German "folksongs"—simple, abiding music, by poets whose names are unknown.

About this time also German prose began to develop, and German drama, too, chiefly in the hands of the clergy. Church plays grew into great and solemn spectacles, of which the celebrated Passion Play of Oberammergau is an impressive survival. And when the Reformation overtook the Church, religion found even more beautiful expression in the fine hymns of Martin Luther. But it was Luther's translation of the Bible which had the most important effect. This did for the German language what the works of Dante, Petrarch and Boccaccio did for Italian, or what the Authorized Version of the Bible did for English. It fixed a standard language from a confusion of dialects. Modern German dates largely from Luther's works.

#### Aftermath of Thirty Years of War

As the years went on, religious disputes became angrier, the Thirty Years' War (1618-1648) broke out, and the light of literature vanished in its horrors. National feeling decayed, and a weak and war-worn generation mimicked French thought and customs in almost every field.

Therefore it was not until the time of Frederick the Great that German literature flourished again. To be sure, this king of Prussia was contemptuous enough of the national literature, he preferred to copy the French style of writing, and honoured French authors, notably Voltaire, far more than he did the rising generation of German writers. But Frederick raised Germany from the dust, and gave to German genius a sense of pride and independence which permitted it to break with French and English models

—in spite of Frederick himself—and create beauty out of its own substance. Thus Frederick's reign (1740-86) ushered in the "great century of German literature."

In this century glow the names of Klopstock, Lessing, Wieland, Goethe, Schiller, Richter, the brothers Grimm, Fouqué, von Kleist, Heine, and many more. Under the influence of English and French philosophers, such as Locke and Voltaire, whose views Frederick broadly championed, the Germans were led into new paths of thought.

To Klopstock goes the honour of moulding a new poetic language. Lessing, the first of the



LUTHER TRANSLATING THE BIBLE

Just as modern English was largely formed by the style and vocabulary of our Authorized Version, so modern German derives largely from the official Saxon speech into which Luther made his translation of the Bible. In this painting by Labouchere, Luther is seen at his task, helped by Melancthon, Pomeranus, and Creutzinger, all great scholars and all as one in their desire for reform in the Church.



### GOETHE AND SCHILLER: GREATEST FIGURES IN GERMAN LITERATURE

The names of Goethe and Schiller are inevitably connected. They were close friends at Weimar, where they both spent the latter part of their lives, and they took part in the same great romantic movement in German literature during the late 18th century. In this picture, Schiller, sitting in his garden at Jena, reads to Goethe the most stirring passages of his new drama, *Wallenstein*. The theme of the play was suggested by Schiller's study of the Thirty Years' War.

great German classic authors, is the master of style, the foremost German critic, who preached the harmony of content and form, and banished the long gusty pages of description and high soaring allegory. Wieland, epic poet and novelist, paved the way for free expression of emotion, and ushered in a new and neater wit.

Then came the influence of Rousseau, the little Swiss who set France on her fateful way to the Revolution. Aided largely by the work of Herder, this influence produced in Germany what is termed the "storm and stress" movement. People began to talk of the perfect freedom of the individual, and to rebel at tradition and authority. Politically, the movement came to nothing in Germany, but in literature the effect of this influence was enormous.

Writers rejected the classical laws of composition under the impression that they were proceeding in the manner of Shakespeare! Goethe, bearer of the greatest name in all German literature, shared in the movement, and like wise the poet Schiller, his shining contemporary.

But presently came the sobering effect of the philosopher, Immanuel Kant, with his stern doctrine of duty, followed by Goethe's swing back toward classicism. Thus the balloon of sentiment was punctured. Perhaps the laughing irony of Jean Paul Richter's novels also had something to do with sweeping away the last bits of the "storm and stress."

However, something very similar to the "storm and stress" again developed during the Romantic period which followed. This was partly due to the philosophy of Immanuel von Fichte, who denied Kant's theories, and of Friedrich von Schelling, who offered the imagination for as good a guide in life as the intellect. The Romantics were individualists, obscure and capricious, but, on the other hand, they freed the wings of poetry and unveiled the beauties of folklore. And, above all, from them came Heinrich Heine, the greatest lyric poet since Goethe.

Heine lived in the years of Germany's struggle against the rise of absolute monarchy. In 1848 the sword drawn for German unity was defeated by Prussian absolutism, of which Treitschke was later the apologist and champion.

During that period there were great names—Wagner (1813–1883), the dramatist musician; Schopenhauer (1788–1860), the brilliant philosopher; Theodor Storm (1817–1888), famous for his idyll "Immensee"; Nietzsche (1844–1900), the apostle of the "superman"; Sudermann (1857–1928) and Hauptmann (b. 1862) the dramatists of modern realism.

In the nineteenth century German scholarship reached great heights, and some of the books of learning of the time are more important than many novels and plays and poems that were written. Thus the great historian Leopold von Ranke (1795–1886) raised the study of history.

to a new level by insisting upon the investigation of original documents. He was followed by a school of historians who worked upon these principles, and his influence spread to this country. The Latin scholar Theodor Mommsen (1817-1903) is said to have mastered all that was known about ancient Rome, his famous *Roman History* has been translated into English. More recently Ulrich von Wilamowitz-Möllendorf (1848-1931) contributed greatly to our knowledge of Greek life and literature, and so also in other branches of learning, in archaeology and anthropology and philosophy, and in all the sciences, the Germans of the nineteenth century, by their surpassing thoroughness and industry, have made great advances.

Many of the books that met with success in Germany after the War of 1914-18 reflected the nation's later experiences. Thus the famous novel, "All Quiet on the Western Front" which



**EMIL LUDWIG: FAMOUS BIOGRAPHER**

Ludwig is a German author, but his outlook is international and he lives in Switzerland. He is one of the most distinguished of modern biographers, having invented a semi-fictional style of bringing to life famous personages from Cleopatra to Abraham Lincoln.

Erich Kästner, whose book "Emil and the Detectives" is known to many children here.

On account of their Jewish origin, or "Left" or liberal political views, many of these contemporary German authors now live in exile.

Eric Maria Remarque (b 1898) published in 1929, echoes the disillusionment of the generation that had gone through the War and something of the same feeling is seen in the writings of Ernst Toller (b 1893), of Fritz von Unruh (b 1885), and of Stefan Zweig (b 1881). Other well known German writers have turned to the past. Lion Feuchtwanger (b 1884) is best known for his historical novel, "Jew Süß" (1924), and Emil Ludwig (b 1881) has written many biographies of famous men, such as Goethe, Bismarck, the Kaiser, Abraham Lincoln, and Napoleon, while to Arnold Zweig we owe clever studies of many great authors.

We must not overlook the writings of

## Man's DEADLIEST FOE—the MICROBE

*Here we learn about the tiny organisms that cause many of our bodily ills, and of the ceaseless battle waged against them by the blood, aided often by the weapons of medical science*

**Germ Theory of Disease** It is generally accepted in medical science that most diseases we now know are due to the presence in the body of exceedingly tiny vegetable or animal organisms, which produce poisons that attack the system. These poisons interfere with the functions of the body, cripple or destroy its various organs, bring about decay and often death. This is believed to apply to nearly all diseases in men, beasts, and even trees and other plants.

We must remember that the world about us—soil, air and water, plants and animals—is filled with millions of invisible living beings called *micro organisms*, from the Greek *mikros* meaning "small." These may be of the vegetable type, called *bacteria*, or the animal type called *protozoa*. The difference is not

important here. The great majority of these creatures are not harmful to man, indeed, they are his most active servants in the cultivation of crops and the destruction of putrefying matter. But others start a work of destruction as soon as they enter the human body in the air breathed into the lungs, with the food we eat, or through the pores or cuts in the skin. These are the disease germs. In ordinary medical speech they are all grouped together as *bacteria*. Their normal habitat is not in the human system, and it is only when an individual's normal powers of resistance to disease are weakened that such germs become harmful. These are divided into *bacilli* (rod shaped), *cocci* (round), and *spirilla* (corkscrew shaped). The term "microbe" is a popular name for all bacteria.

## GERM

The development of powerful compound microscopes in the 17th and 18th centuries had shown the existence of many micro organisms, but it was not until the middle of the 19th century that their activity in producing disease was established. The name of Louis Pasteur (1822-1895) will for ever be associated with the development of bacteriology, as the new science of determining disease causation came to be called. (See Pasteur, Louis) At that time scientists observed that a particular form of bacillus was always found in the blood of cattle and sheep afflicted with anthrax, a violent disorder that killed thousands of the animals every year and even attacked human beings. But this observation was merely a beginning. To prove that these bacilli were the real cause of anthrax, they had first to be isolated, that is, separated from all other substances found in the blood of the diseased sheep or cattle.

This was done in 1863, by Robert Koch (1843-1910), a noted German bacteriologist. The anthrax bacilli then had to be grown in what is called a "pure culture"—that is, allowed to multiply under artificial surroundings without losing their poisonous strength. It was not until 1876 that Koch accomplished this and arranged the final test. A few perfectly healthy sheep were chosen for the experiment. In the presence of several eminent scientists a quantity of the liquid containing the anthrax bacilli was injected into the blood of each of the sheep. Within a few days all had contracted anthrax and died. This is believed to have been the first conclusive proof that any specific disease is caused by a specific germ. Koch also discovered the bacillus of tuberculosis, and isolated the comma bacillus, the germ of cholera.

### Successful Discoveries and Tests

The anthrax experiment started a long chain of successful discoveries and tests which are continuing to this day. Scientists have isolated, one by one, the bacteria of blood-poisoning, erysipelas, cholera, typhoid fever, bubonic plague, pneumonia, meningitis, to some extent yellow fever, diphtheria, tetanus (lockjaw), tuberculosis, leprosy, whooping-cough, and a score of other diseases. In regard to smallpox, measles, scarlet fever, mumps, and a few others, the specific microbe has not yet been observed, but they give every indication of being true germ diseases. Some diseases like influenza

and scarlet fever show evidence of being caused by different forms of germs belonging to the group known as streptococcal bacilli.

Among the principal ailments which have been traced definitely to animal organisms (protozoa) are malaria, amoebic dysentery, and sleeping sickness.

### Where the Germs Settle

Disease germs do their deadly work by forming poisons or "toxins" in the system. The symptoms of a disease depend upon the nature of these poisons and the sites in the body occupied by the germs which generate them. Some germs remain in the blood stream, which carries them poisons to all parts of the system. Others seek out special organs like the lungs, the

stomach, the liver, the intestines and the effects of their poisons are felt most powerfully in these organs. Certain toxins, like those of hydrophobia, attack principally the nerves, the spinal cord, or the brain.

Probably the greatest benefit resulting from the discovery of the germ theory was the fact that it solved most of the mystery of how diseases spread. By studying the habits of germs, scientists discovered how they grow, how they travel from place to place, and how they enter the human body. They learned that few disease germs can live long in the open air and sunlight, but that many thrive, like the

typhoid bacillus, in impure water and milk, or, like cholera germs, in various kinds of food which have been exposed to infection. It was found also that the meat of diseased animals often carried bacteria, and that these bacteria were almost invariably harmful to men.

### How Germs Enter the Body

The entrance of many other microbes has been traced to cuts and scratches in the skin, this is true of the "micrococci" of blood poisoning and erysipelas, and the deadly germ of tetanus. In many of the so called contagious diseases, like diphtheria and scarlet fever, germs may be transferred by clothing or any thing which has come in personal contact with one who has the disease.

Perhaps the most amazing of all these discoveries was that many deadly germs enter the body through the bites of insects. Malaria and yellow fever, for instance, are transmitted solely by certain types of mosquitoes. (See Mosquito) Sleeping sickness is carried from person to



### GERM THAT CAUSES ANTHRAX

Here you see, greatly magnified, a number of the dreaded anthrax bacilli, the causes of one of the most deadly of animal diseases. The black spots on the bacilli are the spores, by which the bacilli breed.



person by the tsetse fly (*See Tsetse Fly*) The bubonic plague is transferred to human beings by fleas which have bitten diseased rats (*See Flea, Rat*) Typhus fever, which scourged some of the war-ridden countries of Europe so terribly during the World War of 1914-1918, is apparently carried by the common body-louse

Not every disease germ which enters the human body actually causes trouble, otherwise we should be ill most of the time, for we take in germs with nearly every breath and every mouthful of food and drink. In the blood and tissues of all healthy persons there is an inherent power to resist and destroy unwelcome visitors. It is when the body is allowed to weaken through bad habits, overwork, improper food, insufficient exercise, etc., that microbes find themselves able to launch their deadly work.

Few germs are able to penetrate the human skin. The favourite breeding places of the *streptococci*, to which group the pus germs belong, are the teeth and the mucous membrane of the nose, mouth, and throat. And these streptococci not only produce a great many disorders themselves, but they are a sort of advance agent, paving the way for other disease germs. Breathed in from the air, they find lodging perhaps in the folds of the tonsils, and if the tonsils have been weakened by mouth-breathing, by dust-laden air, or by exposure to extreme heat or cold, the germs may thrive and start forming pus, which soon gets into the blood stream and infects the whole body. Or it may be that the teeth, through improper care, become refuges for germs.

There are three ways of fighting the diseases caused by germs: (1) by the general destruction of the germs, (2) by preventing them from entering the human body, (3) by overcoming their evil effects, after they have made their way in. The first of these methods is usually carried on by public

sanitation, which strives to do away with the breeding places of germs by disposing of sewage and garbage, by keeping water supplies free from contamination, and so on. The second way is illustrated by personal cleanliness, domestic hygiene, and by fumigating sick-rooms, etc. The last method includes the whole field of curative medicine and surgery, with particular emphasis on vaccine and serum treatments, and specific drugs.

**Geyser.** (Pron gē'zer) Hot springs which erupt every now and then are called geysers. They occur in certain regions of the earth which were formerly volcanic and which have retained considerable heat near the surface.

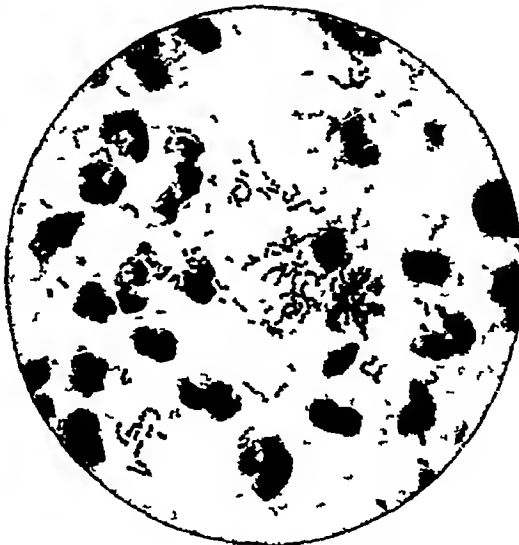
A typical geyser consists of a crater with a funnel shaped opening into the earth. From this opening, at fairly regular intervals, a column of hot water and steam is ejected, sometimes not more than a few feet, and sometimes to a height of 250 feet. You can boil an egg in the waters of some geysers. Until about 1870

Iceland was considered the principal seat of geysers, but we now know that Yellowstone Park, in the United States, contains more geysers than all the rest of the world. New Zealand also has some noted geysers.

The theory of the action of geysers put forward by the chemist Bunsen, of Heidelberg, who went to Iceland in 1847 and made an elaborate study of the Great Geyser in that island is still accepted with some modifications. What happens is this:

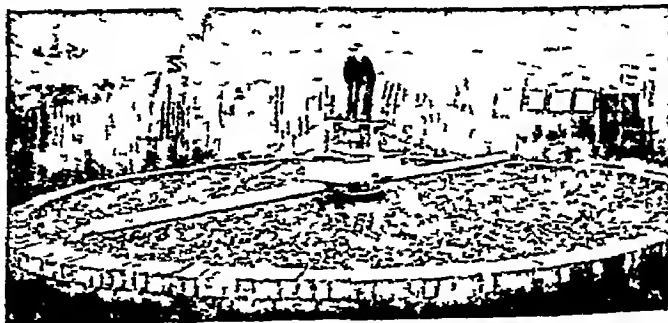
The water, which gathers in the deep throat of the geyser, becomes heated until the lower

portion is changed into steam. This sudden expansion produces a great increase of pressure below which flings the column of water above it violently into the air. Deposits of mineral matter are often laid down round a geyser in the form of one or more basins. This is due to the cooling of the water and to



**DANGEROUS STREPTOCOCCI**

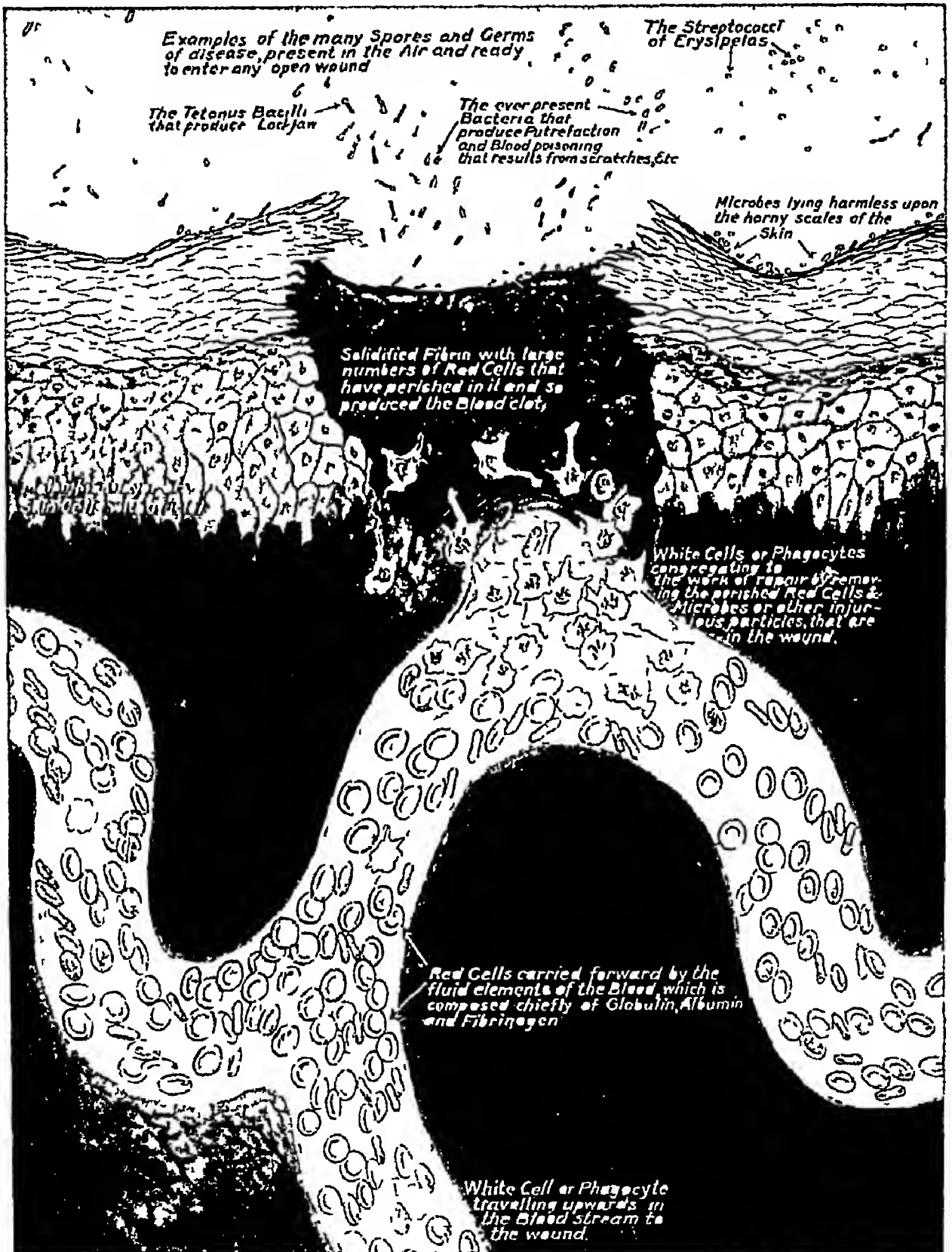
Compare this photograph with that in page 1853 and you will see how different disease germs may be. Those you see here are streptococci, which consist of a number of rounded bodies held together in strings. They cause pneumonia and other inflammatory diseases.



**WHERE GERMS DO GOOD WORK FOR US**

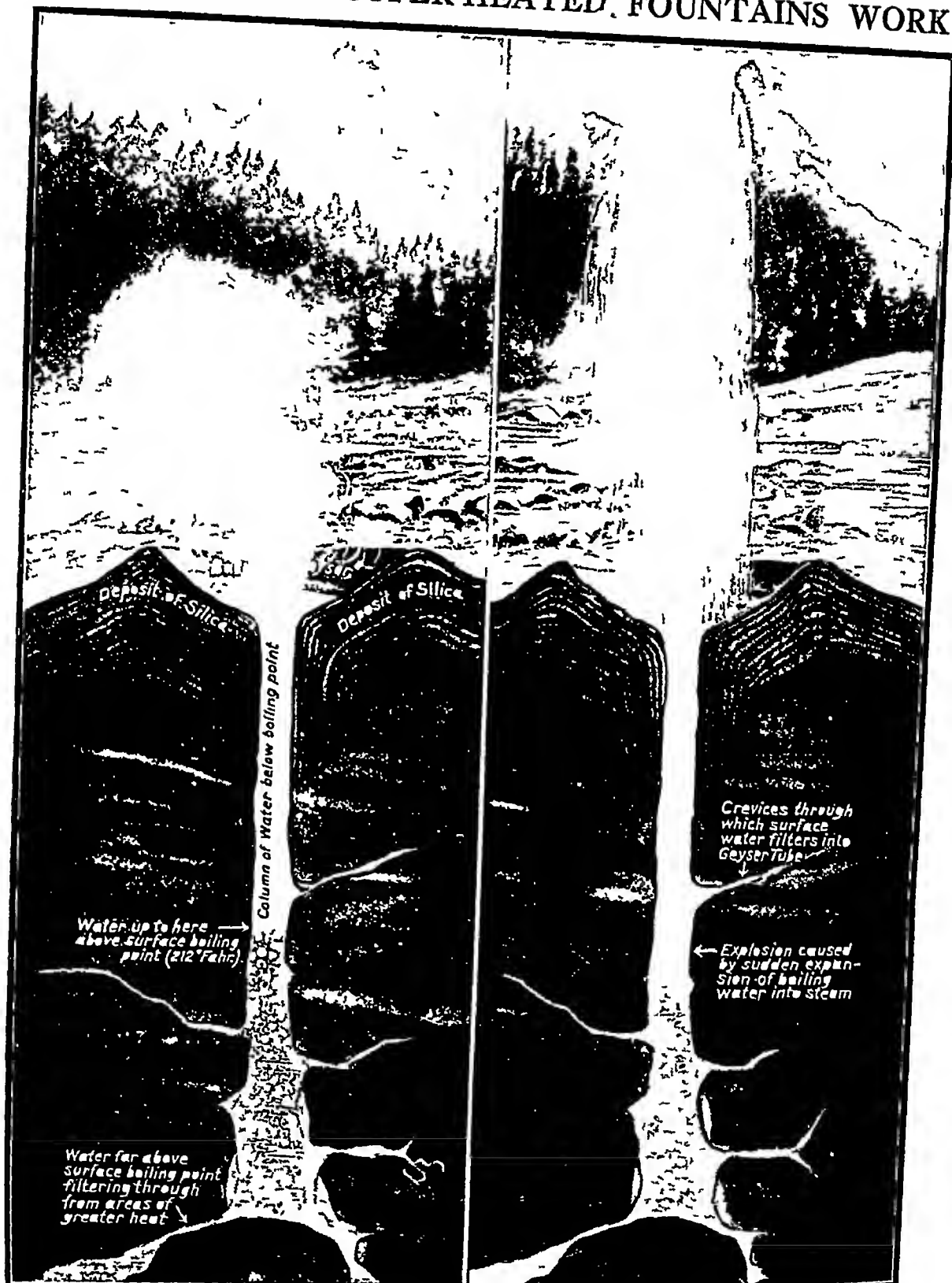
The disposal of sewage is a problem having a direct connexion with disease-prevention, and here you see one of the processes of a big sewage "farm." The liquid sewage is sprayed through sprinklers, so that the air can get at it and valuable scavenger-bacteria can get to work. Courtesy of Tuke & Bell Ltd.

# HOW OUR INVISIBLE DEFENDERS RESIST DISEASE



Here the artist has pictured on a greatly enlarged scale what goes on in a portion of skin no larger than the head of a pin, when disease germs try to enter through a cut or broken place. Beneath the skin is a tiny capillary, with blood passing through on its normal errands. When the skin breaks, the blood of course rushes into the opening. Contact with the air dries it into a clot which fills the wound. But imbedded in this clot are disease germs which had been quick to take advantage of the opening. The blood at once takes up the fight. Certain fluids—"bactericides"—try to kill them directly by chemical action. Other fluids—"opsonins"—try to make them digestible for the white blood cells or phagocytes. These cells swarm to the point and eat the "predigested" germs. You can see several of them with their "meals" already inside. If the body is in good condition and the germs not too malignant, the blood will win. If not, the germs make good their entrance and disease begins.

# HOW NATURE'S SUPER-HEATED FOUNTAINS WORK



Here we can see how geysers like Old Faithful in Yellowstone Park keep such regular time with their spoutings, and how the beautiful geyser basins are made. Water at a temperature far above the surface boiling point, owing to its contact with the hot rocks deep down in the earth, gets into cracks in the rocks, dissolves them away, and forms channels for itself. Eventually these channels reach clear up to the surface. The upper part of the column of water is considerably cooler than the lower, so it acts as a kind of stopper in the geyser's throat and holds the boiling water down until it becomes so heated from below that it explodes into steam and sends the upper part of the column spouting up into the air. This hot water contains a large amount of dissolved matter, much more than it can hold when it cools. The excess material that it deposits when it is cooled by contact with the air builds up the basin about the mouth of the geyser.

evaporation, but chiefly to the influence of minute plants (*algae*) living about the geysers, which have the power of extracting silica, etc., from solution. The beautiful colours of the deposits round geysers are due to the presence of the plants themselves. Some geysers throw up mud instead of water.

**Ghent**, (Pron *gent*), BELGIUM. The Belgian writer Maeterlinck once described Ghent as "the soul of Flanders, at once venerable and young. In its streets the past and present elbow each other," for it is a thriving modern town which has yet many remnants of old world charm. It is famous for its Cathedral of St. Bavo, and there are also some old guild houses and monasteries, and a nunnery founded in the 13th century, surrounded by walls and moats, closely resembling a small town in itself.

The Cathedral dates from the 13th century. It is not remarkable for its architecture when compared with many other cathedrals, but it possesses numerous features of interest, including the famous Van Eyck altar piece, "The Adoration of the Lamb." Some panels of the work were sold in 1816, but were returned from Berlin to Ghent under a provision of the Treaty of Versailles.

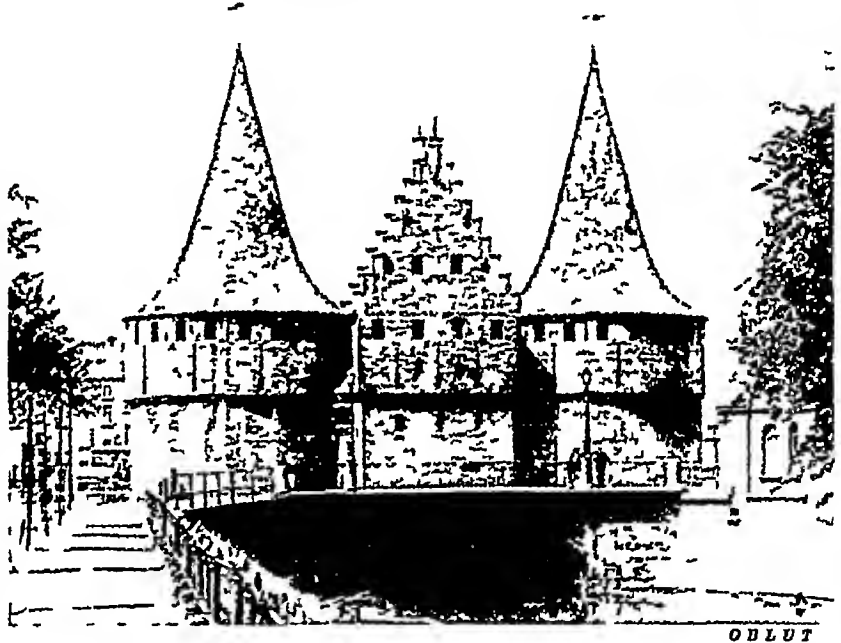
In the centre of the city the belfry still stands in which used to hang the bell "Roland" that called the citizens of Ghent to arms at the approach of danger. There is much to remind the visitor of medieval times when the city was the centre of a great cloth industry and the home of the turbulent and wealthy burghers—"the sovereign town of Flanders for power, counsel, lordship, situation, and all that one can imagine as belonging to a good and noble town."

Perhaps the most picturesque building in Ghent is the imposing medieval castle of the Counts of Flanders. This building is almost surrounded by water, and is one of the finest examples of an old time fortress in Europe. Founded in the 9th century, it was rebuilt by Count Philip of Alsace in the year 1180. Here was born John of Ghent, or as we in England describe him, John of Gaunt, who figured so prominently in English history towards the end of the 14th century.

Ghent is a picturesque city, with a network of canals spanned by more than 200 bridges.

Only eight miles in circumference, it contains extensive promenades and gardens and is sometimes called the City of Flowers. Situated where the rivers Lys and Scheldt meet, and connected with the ocean by a ship canal, it has considerable commerce in agricultural and manufactured products in addition to an important trade in flowers. Though not so notable for manufacturing as in the Middle Ages, Ghent has many important industries. Chief among the city's enterprises are cotton spinning, cotton printing, flax spinning, tanning, and sugar refining. Among the other industries are the manufacture of machinery, tobacco and paper. Large quantities of orchids, azaleas and other greenhouse plants are grown for export.

The early history of Ghent is the usual history of Flemish towns—an endless series of quarrels



GHENT'S GREAT FORTRESS

One of the finest of the many medieval buildings in the lovely and interesting Belgian city of Ghent is the fortress of Rabot, which is illustrated here. Built during the 15th century, it has seen many a bloody war, but it still stands almost perfect, to show us how well and truly the old time craftsmen built.

between the townsfolk and their lords, between the aristocrats and the bourgeoisie, and against the rival city of Bruges. Two of the most famous of the insurrections were those led by Jacob Van Artevelde and his son Philip in the 14th century. During the World War of 1914-18 the city was in the hands of the Germans. The population of Ghent numbers about 165,000.

**Ghiberti**, LORENZO (Pron *gē bër' tē*) (1378-1455). In the year 1403, in Florence, 34 judges sat vainly trying to decide which of two models for a pair of bronze doors was the more beautiful. The models were the best of those presented in a competition held to decide who should make the new doors for the Baptistery of Florence. Then one of the young sculptors,

## GHIBERTI

Brunelleschi—he who a few years later constructed the dome of the new cathedral near by—stepped forward and, saying that his rival's model was more beautiful than his own, withdrew from the competition. The young man whose work so impressed his big hearted rival was Lorenzo Ghiberti, and the bronze doors which he executed are among the many beautiful works of the Renaissance. The stories illustrated on the doors are the life of Christ and of the Fathers of the Church, and the modelling and casting took 21 years to complete.

But far surpassing these in beauty and difficulty of casting are his second pair of doors for the Baptistery, executed some years later. On these Ghiberti worked for more than 25 years. It was these doors that Michelangelo described as being beautiful enough for the gates of Paradise. Their sculptures illustrate stories of the Old Testament in ten panels, and the figures are modelled upon different planes in accordance with the newly-studied laws of perspective. In the first are pictured the creation of Man, the creation of Woman and the expulsion from Eden, in the second, the sacrifice of Abel, with Cain's oxen ploughing in the foreground. Other panels picture the story of Noah, of Abraham, of Jacob and Joseph, of Moses, Joshua, David, and Solomon. Only less beautiful than the figures and background is the border of statuettes and busts surrounding each, and the decorative frieze of fruits and birds.

Ghiberti's early training, like that of many other artists of the Italian Renaissance, was as a

## GIANTS

goldsmith, and the skill in minute detail which he thus learned never deserted him.

**Giants.** Men have always been strangely ready to believe in things which they have not seen, and in earlier days a belief in the existence of giants seems to have been widely entertained. Legends like that of the Cyclops in Homer are common in Europe and Asia, and are retained in the nursery (which is a stronghold of tradition) in stories like "Jack and the Beanstalk." The names of the two Guildhall giants (see illustration below) occur in the Bible.

Scientists are agreed that there never were real giants on the earth, but some individuals have grown to a great size, and have been called giants. One of the largest of which we have record is the Russian, Machnow, who appeared at the London Hippodrome in 1905. He was over 9 feet tall.

The disease called acromegaly, which produces a form of giantism and to which numbers of "show" giants have succumbed, is characterized by excessive lengthening of the bones of the hands, feet, face and cranium. It is due to abnormal functioning of the pituitary body, a small ductless gland situated in the base of the brain.

**Giant's Causeway.** One of the most remarkable of the natural wonders of Britain is the Giant's Causeway. Situated on the northern coast of Co. Antrim, Northern Ireland, amid magnificent cliff scenery, the Causeway is a promontory formed of about 40,000 reddish basalt columns, most of which are hexagonal (having six sides). The geological explanation



**TWO FAMOUS GIANTS IN LONDON'S GUILDHALL.**

These wooden figures, which were carved in 1708, are to be seen in the Guildhall in the City of London. They represent two giants, which are known as Gog and Magog. In one tradition Gogmagog was the name of one giant, while the other was called Corineus, but in course of time the second name became forgotten and the first was split to serve for both. Still more strange, however, is the fact that the two giants were once believed to have been Trojans who, after the fall of Troy, came to England and founded London! In olden days similar figures were carried in the Lord Mayor's procession every year.



## MAGNIFICENT DOORS DESIGNED BY Ghiberti



This second set of bronze doors made by Ghiberti for the Baptistery of Florence are regarded as among the world's greatest masterpieces. 'They are beautiful enough for the gates of Paradise,' said Michelangelo when he saw them for the first time. Ten stories from the Old Testament are illustrated in these panels, and the details of the figures, the perspective and the decorations are worked out with exquisite accuracy and grace. It was Ghiberti's early training as a goldsmith, joined to his genius as a sculptor, which enabled him to achieve such delicate beauty.



REMARKABLE ROCK COLUMNS OF THE GIANT'S CAUSEWAY

Of all the natural wonders of Britain none is so justly famous as the Giant's Causeway in the North of Ireland. The Grand Causeway which you see in this photograph, was built, according to the legend, to enable the great heroic Irish giant, Finn Mac Cool, to stride across to Staffa in the Hebrides. Actually, the Causeway is the result of the strange crystallization of molten basalt many millions of years ago. You can see clearly the shapes of the columns usually six- seven- or eight-sided.

is that these were formed by lava thrown up by volcanoes long ago, the shape being due to the contraction and cracking of the rock while it was cooling. In the Little Causeway is the Wishing Well, a drink from which entitles the visitor to three wishes in the so-called Wishing Chair in the Middle Causeway. It is the Grand Causeway, however, that contains the finest rock formations. There are also great terrace-like cliffs near by. Inevitably a host of legends have sprung up concerning the origin of this romantic spot. The name is derived from the story that Finn Mac Cool, a Celtic giant, built the Causeway to enable him to cross to the Hebrides.

**Gibbon, EDWARD (1737-1794)** "It was at Rome, on the 15th of October, 1764, as I sat musing amidst the ruins of the Capitol, while the barefooted friars were singing vespers in the Temple of Jupiter, that the idea of writing the decline and fall of the city first started to my mind." It was thus that Gibbon came to write one of the great books of the world, "The Decline and Fall of the Roman Empire."

He was twenty-seven years of age when the idea of this work came to him. It proved an immense undertaking, particularly as Gibbon was not an author who was content to make a new book by skimming the cream from scores of

old books. He did not spare himself. He would go any distance, and make any effort, to obtain or verify one grain of fact, or to secure confirmation of a tradition or a supposition.

It took him twelve years of laborious work before the first volume of the "Decline and Fall" was published, and another twelve years passed before the last volume appeared. The publication of his history won for Gibbon world-wide fame, and this fame still endures.

To knowledge, industry, and judgment Gibbon added a sonorous literary style which can only be compared with Burke's, and a power of generalization which amounts to genius. The historical researches of a century and a half have proved little more than the inadequacy of his material, and have not detracted from the skill with which he dealt with the documents at his disposal, or lessened the monumental character of his work. Later criticism, of course, has added many footnotes to a work already heavily footnoted. It must also be remembered that the work falls into two distinct parts, the first of which is extremely detailed, and the second a sketch covering 800 years, which is not equal to the earlier part in knowledge, accuracy, or sense of proportion. However, nothing can detract from the main achievement, one of the

## GIBBON

greatest records of "the crimes, follies and misfortunes of man kind"

Gibbon was born at Putney, April 27, 1737. He was very delicate as a boy, so delicate that his attendance at school was very irregular, and he was frequently under the doctor's care. Indeed all his life he was a sufferer through ill health, which makes his immense literary labours all the more remarkable. He spent much of his life on the Continent, but died in England, Jan. 16, 1794.

**Gibbon.** This is one of the members of the monkey tribe which is of especial interest to us, for it has certain features which show where Man's own stock must have branched off from the type of the primitive ape. For example, it has the orthograde habit when moving about, that is, it runs upright on the soles of its hind feet, and its forelimbs are indeed developed almost exclusively as arms. With them the gibbon swings itself from bough to bough and from tree to tree in the jungles among which it lives, while even along the dizziest branch, fifty feet above the jungle floor, it runs surely on its hind feet alone. It uses its arms as we might in similar circumstances, with just the same action as that of a gymnast swinging on the horizontal bars of the gymnasium. Moreover, the habit of standing, walking, and running in an upright position has affected the whole organization of the



EDWARD GIBBON

The celebrated historian of Rome's "Decline and Fall" is here seen in a portrait painted by Romney in 1783. Gibbon had the high, broad brow of the intellectual combined with the pallor and large eyes of the constant sufferer from ill health.



GRINLING GIBBONS AT WORK

Here we see what John Evelyn glimpsed through the window when he discovered young Grinling Gibbons, later to become so famous, at work in obscurity and poverty. Perhaps he is here working at a carving that still beautifies some London church.

## GIBBONS

gibbon's body, so that it shows a marked difference from that of the monkeys which move about on all fours, and approximates more nearly to Man's internal organization. And, above all, this habit has resulted in the gibbon losing its tail, since this is no longer needed to hang on by. (See illustration in page 213).

In size the gibbon is the smallest of the true apes, and in its very active existence in the tree tops it also differs from its relations, the gorilla, orangutan and chimpanzee. It inhabits the great jungles and forests of Malaya and the other districts of the Far East, there being several species, of which the samang (*Hylobates syndactylus*) is the largest. While the name of "agile gibbon" (*Hylobates agilis*) speaks for itself, it has comparatively little importance other than as a scientific curiosity which may, perhaps give us some idea of the primitive form from which earliest Man was descended.

**Gibbons, GRINLING** (1648-1721). One day in the year 1671 John Evelyn was walking across a field near his home, Sayes Court, at Deptford, then outside London. On his walk he passed by "a poor solitary thatched house." He looked in through the window and saw there a young man carving wood at a table. His beautiful work at once attracted Evelyn's attention, and he went in and questioned the carver. The young man was Grinling Gibbons, then

poor and unknown Evelyn at once saw the quality of the carving, and it was he, later on, who brought Gibbons to public notice and secured him royal recognition. Working for the king, Charles II, and for Sir Christopher Wren among other eminent people, Gibbons did much statuary, but it is as the greatest of all English carvers in wood that he is now remembered.

Much of Gibbons' carving fortunately remains with us. Notable pieces are the choir stalls of St Paul's Cathedral, a ceiling at Petworth, in Sussex, perhaps his finest work, and carvings in many Wren churches and in great houses all over the country. He was especially fond of carving natural objects, such as flowers, fruit and birds, spending hours over the slightest detail, yet when he gave his attention to subjects such as lace he amazed every one with his ingenuity. Besides the work mentioned, there are fine pieces by him in the Victoria and Albert Museum, especially a superbly executed lace cravat in lime wood. His statues, which are not of such a high standard, included two of his royal patron—at Chelsea and the Royal Exchange—and one of James II, in Whitehall.

**Gibraltar.** Like a reclining lion dozing in the southern sun, the great rock of Gibraltar looks sleepily across the 12 miles of water

which separate this southernmost point of Spain from Ceuta, on the African side of the strait leading into the Mediterranean. But in case of need this peaceful seeming rock can leap into thunder and flame from powerful cannon which he hid in many a waterside or rock-hewn battery. Gibraltar for more than 200 years has been a garrison and crown colony of Great Britain, and one of her naval bases on the Mediterranean route. The harbour can accommodate the largest ships, and is an important coaling station for merchant vessels. The fortifications are so strong that the rock is considered impregnable. The eastern side is so steep as to be altogether secure from assault.

Gibraltar lies at the end of a low sandy peninsula, about three miles long and half a mile in average width. The rock itself rises to a height of 1,408 feet. Its western side is washed by the Bay of Gibraltar, where at the foot of the rock lies the town of Gibraltar, with a civil population of some 17,000 besides the garrison, which in normal times numbers about 3,000 men. Aliens are not allowed to reside in Gibraltar without a special permit from the British authorities. At the northern end of the rock is an open space, part of which, lying between the British and the Spanish lines, is called the "neutral ground" and is uninhabited.

Gibraltar, and the opposite African cape, were called by the Greeks the "Pillars of Hercules," and were once thought to be the western limit of the world. Gibraltar takes its name (Jebel al Tarik, "hill of Tarik") from the Mahomedan chief who led his troops across the straits in A.D. 711, captured it, and built a fortress there. In 1704 it was captured from the Spaniards by the British, and has remained in their possession ever since. It has endured many sieges, especially the great one of 1779-83, when the garrison held out against a joint besieging force of French and Spaniards. The final episode was the grand attack in September,



**GIBRALTAR SEEN FROM THE AIR**

This striking aerial photograph shows the famous rock of Gibraltar from the south, just above Europa Point. On the left is the harbour. The narrow strip of land which connects Gibraltar with Spain is on the other side of the rock. In the far distance may be seen the town of La Linea, in Spain proper.

1782, by a fleet especially equipped with massive wooden armour. Every attacking ship was blown up or burnt to the water's edge by red-hot cannon balls fired from the batteries.

**Gilbert & Sullivan.** The remarkable series of popular light operas, in the production of which Sir W S Gilbert was associated with Sir Arthur Sullivan as music composer and Richard D'Oyly Carte as theatrical manager, started in 1875 at the Royalty Theatre. Sir William Schwenk Gilbert (1836-1911), English humorist, was the son of a novelist, and was born in London, November 18, 1836. He began his career as a Civil Servant, and later was called to the bar. In 1861 he started to contribute articles and drawings to "Fun," in which his "Bab Ballads," collected in 1869 and 1873, appeared. Then followed several burlesques and three fairy plays, "The Palace of Truth," 1870, "The Wicked World," 1873, and "Broken Hearts," 1875, a classical romance, "Pygmalion and Galatea," 1871, and two comedies, "Tom Cobb," 1875, and "Engaged," 1877. Gilbert also wrote several serious plays, and contributed short stories to many periodicals.

Sir Arthur Seymour Sullivan (1842-1900), English composer, was the son of an army bandmaster, and was born in London, May 13, 1842. As a child he was a proficient performer on wind instruments. At the age of twelve he entered the choir of the Chapel Royal, and from 1856 to 1861 he studied at the Royal Academy of Music under Sterndale Bennett, and at Leipzig under Moscheles and David. He experienced no difficulties in getting his early works performed, and he sprang into immediate popularity with his music to "The Tempest" in 1862. His settings of Shakespeare's songs increased his popularity. In 1864 his ballet, "L'Ile Enchantée," was performed at Covent Garden, where he was in the same year appointed

organist. Further successful compositions followed, and in 1867 Sullivan achieved fame in another direction when he went to Vienna, and, with Grove, discovered many lost works by Schubert.

Sullivan first made his name as a composer of comic opera with his music to "Box and



#### GILBERT AND SULLIVAN

A partnership famous in the annals of English entertainment was that of Sir William Gilbert (top) and Sir Arthur Sullivan (below left). They collaborated in the composition of a number of comic operas, Gilbert writing the words and Sullivan the music. The photograph immediately above is of a scene from "The Pirates of Penzance," as performed at the Savoy Theatre.

Photos: Russell Elliott & Fry



Cox," produced in 1867. After this he turned to serious subjects, his first oratorio, "The Prodigal Son," being heard in 1869. In 1871 he returned to the stage with "Thespis," the first light opera in which he collaborated with W S Gilbert.

Sullivan extended his reputation in many directions, his other compositions ranging from the part song, "Oh Hush thee, My Baby," to a setting of the hymn, "Onward, Christian Soldiers," and included a festival "Te Deum," 1872, "The Light of the World" oratorio, 1873, and the music for "The Merry Wives of Windsor," 1875. He was appointed in 1876 first director of the National Training School, later the Royal College of Music, and, knighted in 1883, acted as conductor of the Philharmonic Society, 1885-87. The oratorio, "The Golden Legend," 1886, based on Longfellow's poem, achieved an unexpected



success in this same period, of which latter, however, the best-known production is the song, "The Lost Chord," 1878, which was written while Sullivan watched through the night at the bedside of his dying brother.

In 1891 Sullivan turned to grand opera, a field hitherto never successfully explored by an Englishman. At tremendous expense his opera, "Ivanhoe," was produced by D'Oyly Carte, but it proved a failure.

Sullivan's remaining compositions include songs, one symphony, music to "Macbeth," "Henry VIII" and the "Merchant of Venice," and some church music.

For 20 years Gilbert and Sullivan worked together in harmony, producing a series of light operas which never seem to lose their charm, despite their repeated revival.

"Trial by Jury" was produced at The Royalty in 1875. "The Sorcerer" followed at the Opéra Comique, London, in 1877, "H.M.S. Pinafore" in 1878, "Pirates of Penzance" in 1880, and "Patience" in 1881. At the Savoy, "Iolanthe" appeared in 1882, "Princess Ida" in 1884, "The Mikado" in 1885, "Ruddigore," 1887, "The Yeoman of the Guard," 1888, "The Gondoliers," 1889, "Utopia Limited," 1893, and "The Grand Duke," 1896.

The audiences of their own day possibly appreciated the satire of Gilbert's words better than those of later times, on whom much of the humour is necessarily lost and to whom Sullivan's music is probably the greater attraction. Nevertheless, words and music have never been more perfectly welded to form one delightful whole. Of the operas themselves "The Mikado" has proved the most popular, but "Patience" is the most brilliantly written, and "The Yeoman of the Guard" the most poetical.

Gilbert met a tragic death by drowning, at Harrow, on May 29, 1911.

Sullivan was seized by illness when writing his opera "The Emerald Isle," and he died on November 22, 1900, before it was complete. Sir Edward German finished this opera in 1901.

**Ginger.** The history of ginger goes back to a remote period in India. The Greeks and Romans imported it, and during the Middle Ages it was next in value to pepper, a pound costing as much as a sheep. It is an important commercial crop in India, China, West Africa, in the West Indies, and in Central America. Jamaica ginger is the finest and most valuable.

Ginger spice is made from the root-stocks of a perennial reed-like plant, *Zingiber officinale*, similar in appearance to our iris. Ginger is marketed in two forms, preserved or green ginger, and dried or cured ginger. China supplies practically all of the preserved ginger, which is prepared with sugar syrup or honey. For dried ginger the root is dug out after the

leaves of the plant have withered. When the skin is left on it is known as "black ginger", when it has been removed before drying, it is "white ginger". The essence of ginger used in flavouring is a tincture of ginger and alcohol.

Another important member of the ginger family is turmeric, whose powdered roots are used as a yellow dyestuff, as a condiment (especially in curry powder), and in medicine.

**Ginkgo.** (Pron gink' gō or jing' gō) This tree (*Ginkgo biloba*) is usually called the maidenhair tree, for its curious leaves resemble fronds of a maidenhair fern. A native of China and Japan, it is the sole survivor of a group once widely distributed over the world. It is a graceful tree, with numerous slender branches, which form a cone-shaped head. You may see examples in the gardens of large English houses, these are usually the tall, slender male trees, the females, which in Japan bear small cones, being broader and less tall. The tree is considered sacred.

**Giotto.** (Pron jot' to) (1267?-1337) An enchanting bell tower of variegated marble piercing the skies of Florence with restrained ethereal grace, its surface adorned with beautifully pointed windows, slender columns, exquisite statues and reliefs—thus is the world famous "campanile" of Giotto di Bondone, the great Italian artist who stood at the dawn of the Renaissance.

This square tower of red, black, and white marble rises in five storeys to over 275 feet—a large part of it Giotto's design, and some of it (such as the first course of sculptured medallions, a wonderful series representing primitive arts and industries) actually the work of his own hand. A Florentine's expression for perfect beauty runs, "as beautiful as Giotto's tower!"

But it is as a painter and not as a sculptor or architect that Giotto is, perhaps, best known in the world. He was born at Vespignano, a few miles north of Florence, and the story is told that the artist Cimabue discovered him, as a boy of 12, drawing one of his father's sheep on the ground with a pointed stone, and, attracted by his talent, made him his apprentice. Soon he began to adorn church walls with wonderful frescoes of saints and Biblical characters painted on the fresh laid plaster—pictures that in those days served as a people's Bible. His earliest works are at Assisi, the birthplace of St. Francis, in whose church he painted some scenes in the life of that most lovable of saints. Later he executed commissions at Rome, these mosaics and paintings establishing his reputation.

Giotto's life was one of tireless labour. The greatest men of Italy sought his work, and the poet Dante was his close friend and adviser. In the 38 masterly paintings of the Life of Christ and the Virgin, of the Last Judgement, and

other Biblical scenes which Giotto executed for the Arena Chapel in Padua, he reached the supreme height of his genius. Almost every big city of Italy claims to have had some of his frescoes, and though few undisputed examples remain, there is no doubt that he visited and worked in all parts of Italy.

Giotto's last years were spent in Florence as chief architect of the Duomo (cathedral), and in working on his campanile both of which were left unfinished at his death in 1337. He was buried in the cathedral with great honours. The story of Giotto will live for ever, a glorious romance in the sphere of art, illustrating in a striking way that genius is a thing altogether apart from wealth or education.

Over a century later Lorenzo de'

Medici erected a fine monument to him with an epitaph which truthfully says, "Lo, I am Giotto—what need is there to tell of my work? Long as verse lives, my name shall endure!"

Among the most famous of Giotto's paintings are his passionate and dramatic "Death of St. Francis" and "Ascension of St. John," in the Church of Santa Croce, Florence, his portrait of Dante, also in Florence, his "Christ before Caiaphas," and his simple and beautiful "Visitation of Mary to Elizabeth," in Padua. These and others of his paintings reveal to us the simple original genius of the greatest painter Italy produced before the flowering of the Renaissance and one who, it has been justly said, revived the art of painting and gave it an impetus which endured for the best part of a century. (See illustration under Francis of Assisi.)

**Gipsies.** The untamed, nomadic race called gipsies has kept alive a tradition that goes back to the days when our own ancestors were wandering tribesmen on the plains of Europe and Asia. And the instinct that still makes the hearts of settled people yearn sometimes for



A MASTERPIECE OF THE EARLIEST 'OLD MASTER'

The name of Giotto is among the earliest in the list of the world's great painters, and indeed he is the first of the really great masters. Although you can see how primitive in many ways was the art of this Florentine, there have been few men indeed since his day who could give us so marked an impression of nobility and sanctity in paint. Here you see, in a fresco from Padua, St. Joachim, the father of the Virgin Mary, with the Shepherds.

*Photo Anderson*

far horizons sharpens our interest when we see a care-free gipsy caravan on a country road.

Gipsies have naturally delighted the souls of artists. Though they have no literature of their own—except for a few stories and songs—their figures have enlivened the literatures of many lands, where they appear as romantic dwellers on the heath, or as impudent beggars, lawless vagabonds, and crazy witches. In music, the soul of the gipsy has found its fullest expression. Liszt, in his "Hungarian Rhapsodies," tried to catch the wild gaiety and haunting sadness he had heard around the gipsy camp fires. Some authorities believe that much Rumanian and Spanish music is also of gipsy origin.

Since they have no written records, the gipsies do not know who they are or where they came from. They used to be called Egyptians, and the name "gipsy" is derived from "Egyptian," but their language, now divided into many dialects, had its origin in India. They probably left India at the time of Alexander the Great. Later, apparently fleeing from the Turks, they appeared in Germany about 1414. They reached

## GIPSIES



with the bright colours of which they are so fond

They have many interesting customs. A newly born babe is always bathed in running water. At a wedding the bride and bridegroom leap over a fire, and then have their hands cut and bound together, so that their blood mingles. The caravan of a dead person is never occupied again, but is burnt. Customs such as these, their strange appearance, their habit of fortune-telling, and their belief in astrology aroused the wonder, and often the hostility, of other people, who attributed all sorts of evil powers to the gipsies. During the Middle Ages especially the gipsies were often persecuted because they were not Christians and because they were regarded as sorcerers.

Treated with hostility, the gipsies became stealthy, secretive, thieving, and unscrupulous in trade. Yet, because they were expert at treating sick horses, and were skilled metal workers, horseshoers, musicians, and circus entertainers, they were in time tolerated in most parts of the world. Anyone outside their own race who proved that he was their sincere friend found them loyal and affectionate.

Each tribe of gipsies has its elected leaders, who are called kings and queens. The best known tribe is the Zingari.

England about 1500, and by 1505 were settled in Scotland.

Their language contains numerous words borrowed before that time from the ancient Slavic, Greek, and Armenian. They call this language Romany, from the gypsy word *rom*, meaning man. Other languages have adopted a number of Romany words, but usually as slang, such as *pal* (comrade).

There are 14 different dialects of the "Romani chib," as gipsies call their language in Europe. These dialects are becoming more and more corrupt, mixing other words of all sorts with the Romany words, and adopting the grammar of the country where the gipsies find themselves.

The gipsies' way of travel is in caravans or wagons, packed with goods, utensils, children, and pet dogs. Their caravans are usually decorated

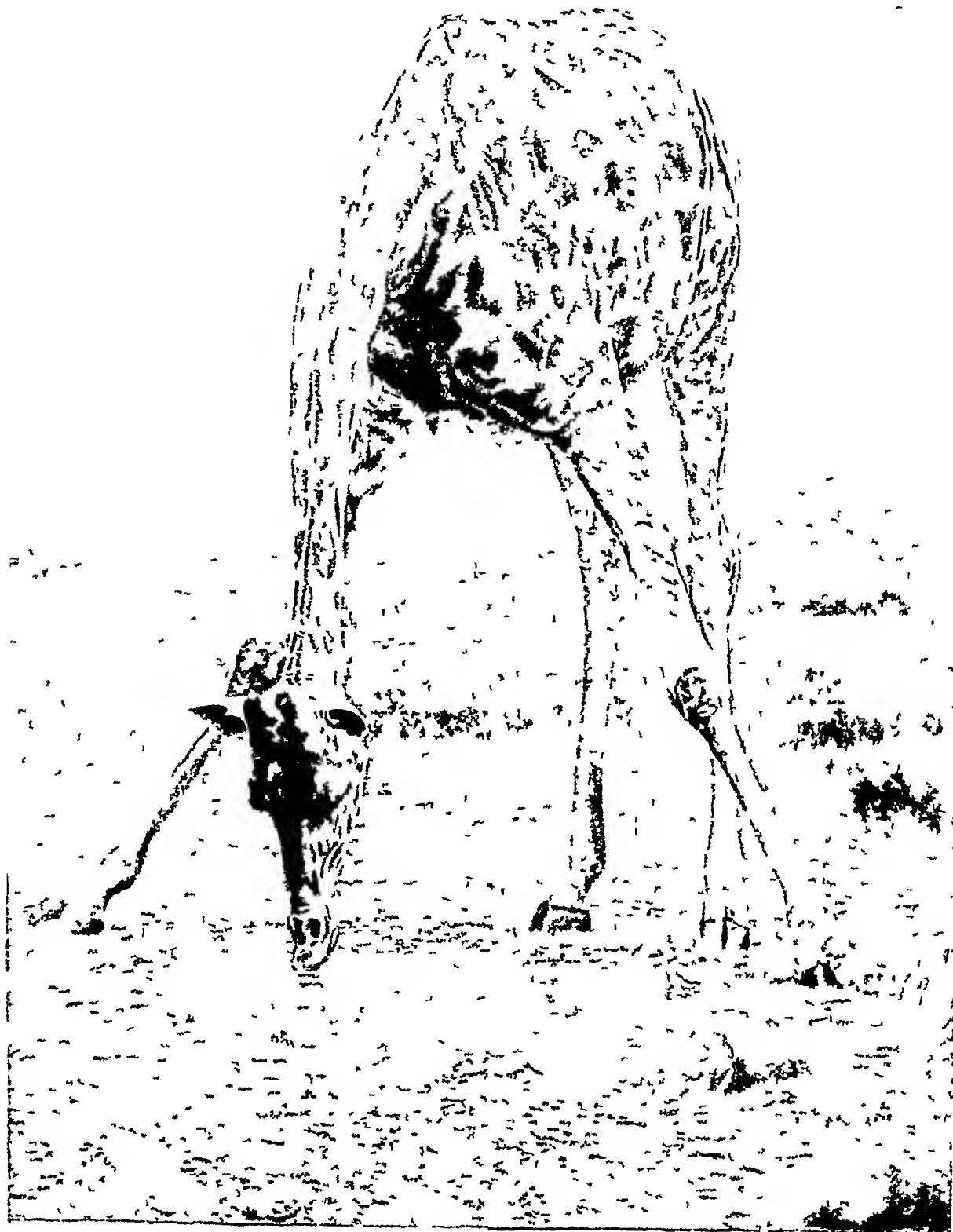


### GIPSY CUSTOMS OF LIFE AND DEATH

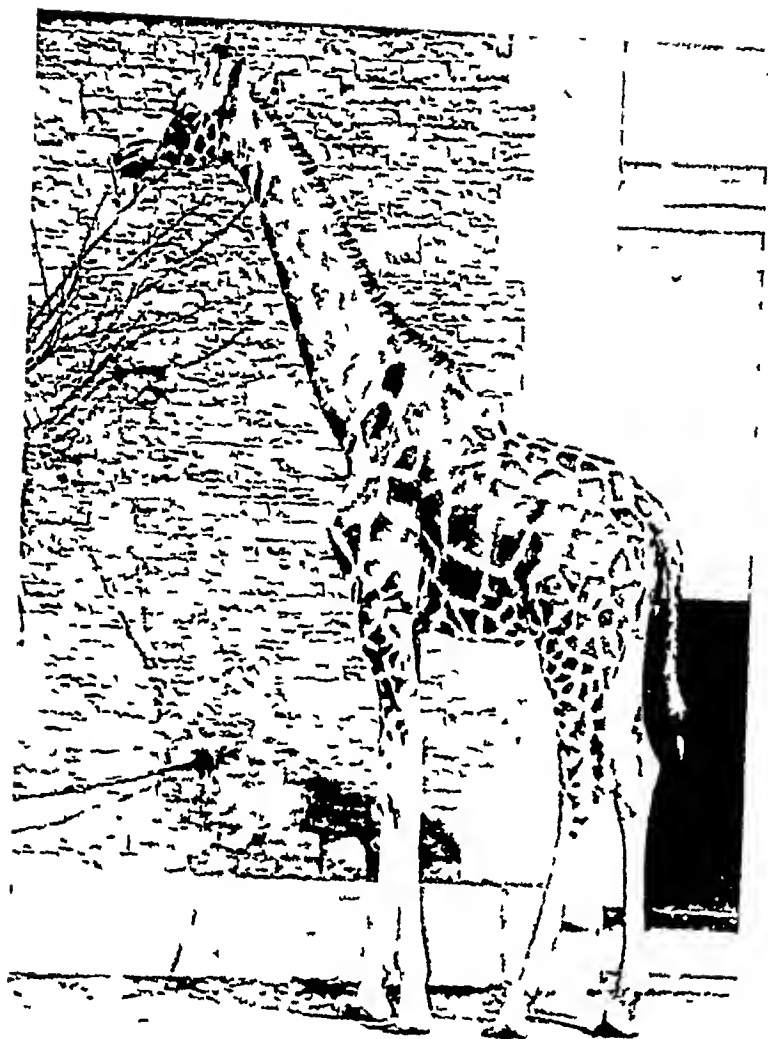
Not only the Romany language sets true gipsies apart from the natives of the lands which they wander, for these strange folk have many customs of their own. The girl with her front hair plaited and tied with a bow, at top, is smoking a pipe with as much pleasure as her brothers do; the lower photograph shows the burning of a caravan and all its contents after its owner has died.

Photos F. B. Hinkins Sport & General

## THE GIRAFFE'S NECK IS NOT A BIT TOO LONG!



Long as is the neck of the giraffe it is none the less too short to enable the beast to drink without really getting down to it ' so to speak and here we see the way in which it does so. This is an outstanding example of an organ developed principally in connexion with the beast's feeding habits since by its long neck the giraffe can reach leaves and twigs out of reach of other creatures.



### THE LONG AND LANKY GIRAFFE

**N**O one would blame you for laughing at a giraffe, for there can be scarcely any other animal whose general appearance is quite so ludicrous. And it is no wonder that the ancients called it "camelopard," for it does indeed look like a camel that has somehow tried to get into a leopard's skin. Just as the leopard uses its black spots on a yellow ground for concealment in the jungle, so the giraffe profits by the colour and design of its hide. For the pale network breaks up the darker brown patches and, by just the same system as the "dazzle painting" of ships, makes the giraffe far less conspicuous than it would be if it were wholly of one colour. The tremendously long legs of the giraffe also look rather strange, because they join the body in a way which allows them to be bent with greater freedom than those of other beasts. With them the giraffe can run at a surprising speed over the dry African soil.

*Photo J. E. Saunders F.Z.S.*



about whom George Borrow wrote When a new camp is made, the men put up the tents and set out baskets, rugs, or wooden articles for sale The women and children tell fortunes or beg Often the men mend pans, pots, and kettles

No one knows exactly how many gipsies there are Some groups are still almost pure, but many have mixed freely with other races Perhaps 700,000 could be identified Several countries—particularly Russia—have tried to merge them with the rest of the population Schools established for them have not been successful in England, but at least one, at Uzhorod in Czechoslovakia, has turned out well In Rumania, the gipsies themselves, in a huge congress of the United Gipsies of Europe, held at Bucharest in November, 1933, urged education and "civilization" Many of the 300,000 Rumanian gipsies have become farmers

Distinguished among the authors who have written about gipsies are George Borrow, (*qv*) whose two best books on this theme are "Lavengro" and its sequel "The Romany Rye", W F Starkie, whose "Raggle Taggle" is the story of a scholar musician's wanderings with the gipsies, and Konrad Bercovici, whose "Story of the Gipsies"

is based on what he learned at gipsy camp fires in his native Rumania Nor must we overlook the charming picture of a gipsy which Keats drew in his poem "Meg Merrilies"

**Giraffe.** The giraffe is the tallest of all living mammals, its head rising from 16 to 20 feet from the ground This height, however, is not due to the size of its body, which is smaller than that of the average horse, but to its exceedingly long and slender legs, and its extraordinarily long neck When it drinks, the giraffe has to straddle its legs far apart

You may ask, Why did Nature produce such a freak? As usual science has an answer ready The giraffe dwells in a country where grass is scarce, its food consists of leaves But the trees in such regions are almost bare of branches for quite a distance from the ground, therefore the giraffe has developed a long neck and long legs

to enable it to browse comfortably on the tops of such trees Its tongue is in keeping with this purpose, for it often measures a foot and a half in length, while its very long upper lip is also adapted to the same end Moreover, its height enables the giraffe to see over the grass and scrub, so that its enemies can stalk it only with difficulty

Having produced such a strange creature, Nature has camouflaged it for protection by giving it a spotted skin of brown and yellow As the giraffe stands among the mimosa trees (its favourite feeding place), its skin resembles the play of light and shadow through the leaves, so that it is exceedingly difficult to detect



THE GIRAFFE'S STRANGE FACE

What a curious beast is the giraffe! Not only has he those long legs and enormous neck, but, as you see here, his face is also extraordinary Huge, limpid eyes, a long, prehensile upper lip—very useful for pulling leaves off trees, pointed ears, and those stubby little horns combine to make him really rather ludicrous These giraffes are looking out of the 'loose boxes' in which they are travelling to a zoo

In one form of giraffe both males and females possess horns but usually they are confined to the males They consist of bony horn like projections covered with skin, each crowned with a tuft of bristles In front of and between these projections is a round bony elevation which appears like an undeveloped third horn

The movements of the giraffe are as curious as its structure It cannot trot, but it runs at a heavy gallop The Arabs hunt the giraffe with their fleetest horses and yet find difficulty in overtaking it The flesh is in great demand for food, and the skin is used for leather

In their native state giraffes are usually found in small herds They chew their cud while standing erect, and wary hunters have seen specimens leaning against trees, fast asleep

The giraffe is entirely without a voice, but the senses of sight and hearing are acutely

## GIRAFFE

developed, and it is very intelligent. Although it is good-natured and gentle, it will fight in self defence, using both head and legs as weapons. The head on its long neck can be used to deal heavy blows. In defence of her young a female giraffe has been known to kill a lion.

Giraffes were known to the ancient Egyptians and Greeks, and many were exhibited in the old Roman games. They were thought to be a mixture of a camel and leopard, and were called "camelopards"—a name which remains in the scientific name, *Giraffa camelopardalis*.

The range of these animals formerly extended over the African continent from the Indian Ocean to the Atlantic, but they are now confined to the plains of eastern Africa, between the Sahara Desert and the Zambezi.

**Girl Guides.** When Lord Baden-Powell organized the first Boy Scout troops in England in 1908, he little thought that he was preparing the way for a world wide programme of scouting, in which girls, as well as boys, would take part. At the first Rally of the Boy Scouts, at the Crystal Palace in 1909, a small but determined group of girls faced the Chief Scout and insisted that they wanted to be Scouts, so that they also could enjoy the Scout programme of work and play. Lord Baden-Powell therefore asked his sister, Miss Agnes Baden-Powell, to help him to form an organization for girls similar to the Boy Scouts, and to this organization the name of Girl Guides was given.

In England the movement went ahead rapidly, and it also spread to all parts of the Empire and to many European countries. At present the number of Girl Guides in the

British Empire exceeds 700,000, and throughout the world there are more than 1,400,000.

The Guide movement is divided into three main branches to suit the needs of the various ages of girlhood.

The Brownie Branch caters for children of 7 to 10 years of age. A pack of Brownies numbers about 24, working under two adult leaders, or Guiders, known as Brown Owl and Tawny Owl. The pack is divided into sixes, under a child leader or Sixer.

## GIRL GUIDES

Girls of 10 to 16 are enrolled as Guides, working in companies with two Guiders called captain and lieutenant. The Guide company is divided into patrols, under patrol leaders chosen from among the girls by the Guides.

The Ranger Branch caters for girls of 16 and over. As many girls of Ranger age are interested in the sea and nautical matters, Sea Ranger crews have been formed, in which they can train in the handling of boats. In the few years preceding the outbreak of war, in 1939, training for Sea Rangers was given on board the "Implacable" and "Foudroyant" at Portsmouth. Hundreds of girls attended for training which lasted for a fortnight at a time, and were given expert tuition in signalling, boating, knotting, first-aid and other matters, by the regular instructors attached to these ships.

The Girl Guide badge is a trefoil, the leaves representing the three promises that a Guide makes on enrolment, "To do her duty to God and the King" (where there is no King the word "country" is substituted), "To help other people at all times", and "To obey the Guide law".

The Guide law is made up of ten separate laws calling for truth, loyalty, helpfulness, friendliness, courtesy, kindness, obedience, cheerfulness, thrift, and purity. The motto is "Be Prepared".

That the Guides take their motto seriously was amply proved at the outbreak of war in September 1939 when they volunteered immediately for any kind of service, and many Guiders were called to the Women's Services. As the Princess Royal said in a message to Guides: "I am proud to think that Guide training has proved a ready passport into any field of service." Their absence left the many Guides without adult leaders and threw great responsibility on to the patrol leaders. Nothing daunted, the Guides were to be found on railway stations comforting crying babies, reassuring tired mothers, carrying luggage, helping with bulleting and such like tasks. They were on duty at reception offices as dispatch runners, in hospitals as orderlies, helping with patients padding splints, and making bandages.

The Guides now have their own salvage scheme, entitled "Save all Supplies," by which almost every conceivable form of waste material is collected and sold and the money used to buy wool and similar materials to make into hospital supplies and comforts for the troops. They are also keen workers on allotments. Many Rangers have joined up as nurses, auxiliary fire women, A.T.S., W.A.A.F., and W.R.N.S.

The Princess Royal is president of the movement, and Lady Baden Powell is the Chief Guide. Headquarters are at 17-19, Buckingham Palace Road, London, S.W.1. (See also Boy Scouts)



**GUIDE BADGES**

Six badges, additional to those on the facing plate. (Top) Keep Fit and Woodman, (centre) Emergency Helper and Player, (bottom) Handbell Ringer and History lover.

# GIRL GUIDE BADGES OF DISTINCTION



1 Ambulance, 2 Artist, 3 Star lover, 4 Athlete, 5 Basket worker, 6 Bee farmer, 7 Bird lover, 8 Boatswain, 9 Book lover, 10 Friend to the Blind, 11 Carpenter, 12 Child nurse, 13 Clerk, 14 Cobbler, 15 Cook, 16 Cydist, 17 Dairy worker, 18 Dancer, 19 Domestic Service, 20 Aircraft, 21 Sitter, 22 Entertainer, 23 Fire Brigade, 24 Countess/Dancer, 25 Friend to Animals, 26 Gardener, 27 Pioneer, 28 Gymnast, 29 Handy woman, 30 Health, 31 Hiker, 32 Camp Fire Singing, 33 Horse woman, 34 International knowledge, 35 Interpreter, 36 Knitter, 37 Farm worker, 38 Landdress, 39 Life saver, 40 Decora lover, 41 Needlecraft, 42 Music lover, 43 Lacemaker, 44 Naturalist, 45 Needlewoman, 46 Pathfinder, 47 Photographer, 48 Flower lover, 48 Poultry Farmer, 49 Home-maker, 50 Rifle shot, 51 Scuba, 52 Clerk, 53 Signaller, 54 Singer, 55 Skater, 56 Spinner, 57 Hostess, 58 Minstrel, 59 Swimmer, 60 Friend to the Deaf, 61 Toy maker, 62 Writer, 63 Thrift

(NOTE—Since the above design was made Badges Nos 28 and 31 have been changed slightly rope and the latter the bull's head in outline only)



## GLACIER

**Glacier.** Of all the forces at work carving and polishing the face of our earth, perhaps the strangest and most awe inspiring are the glaciers, great rivers or seas of ice, pouring invisibly down a mountain side, carrying huge boulders, breaking off hill sides, building up walls and mounds of stone, and working slowly, imperceptibly, over the long years. They look as still and motionless as the rocks they move. How do they work? What starts them on their age long tasks? In many high mountains the amount of snow which falls in winter is so great that the summer heat cannot melt it all. Where this takes place year after year, the amount which accumulates in the upper ends of mountain valleys comes to be very great. These areas where the snow lasts from year to year are known as snow fields. In the sunny days of summer the surface snow of a snow field melts, and the water, sinking into the snow, freezes beneath the surface, and helps to change the snow to ice. The pressure of the weight of the snow above assists this freezing process, which, constantly repeated, gradually

changes the larger part of a snow-field into ice. Just below the snow, at the top, the ice is not very compact, but farther below the surface it is solid. A snow-field is therefore really an ice field covered with snow.

When the ice becomes sufficiently deep, it begins to creep down the slope, obeying the laws of gravity. Ice which has this slow creeping movement down a mountain valley from a snow-field above is a "valley glacier." There are many valley glaciers in the Alps and other high mountains of Europe, as well as in other regions.

There is another great type of glacier, which is not a valley glacier. When the snow and ice accumulate in quantity on a plain or a plateau, the mass moves outwards from the centre in all directions. This sort of glacier is an "ice cap," and may be likened to a spreading ice lake. If it is very large, it is a continental glacier. Some 300,000 or 400,000 square miles of Greenland are covered with such an ice cap, while the area of ice around the South Pole is still larger.

Glaciers move at the rate of a few inches or a few feet a day. There are, perhaps, glaciers

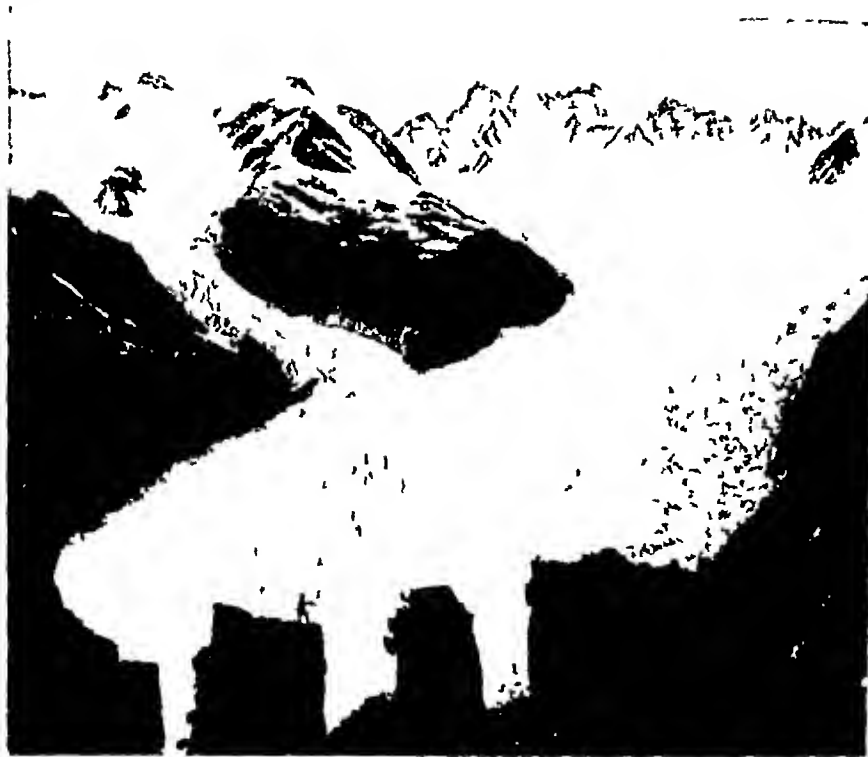


**GIRL GUIDES BUSY AT CAMP**

Three of these photographs show you the fine times Girl Guides have when they go to their annual camps. At the top, right, a party on patrol hike are making a fire. On the left below, a little party, sitting round their camp fire, are making ready for the rest of the troop who will occupy the tents they have pitched. And on the right a girl in her special summer camp uniform is bringing part of the bread supply. Top left is the flag of the Kingfisher patrol of which Princess Elizabeth is a member.

*Photos Girl Guides Assn. For Photopress*





#### DANGEROUS BEAUTY OF THE MOUNTAIN GLACIER

Running like a great river of ice down among the mountains of South Island, New Zealand, the Franz Josef Glacier is a typical example of its kind. Observe the broken surface of the ice in the foreground, impossible to traverse, and the smooth but little less dangerous flat field of snow and ice at the head of the glacier. The rocks that cross the foreground of the picture on which the figure of a man is seen are known as the Castle Rocks.

New Zealand Government

which move as much as 100 feet a day, but few of them move more than 3 or 4 feet. During the movement the ice becomes cracked, especially where the ground over which it passes is rough. Thus it is that big cracks, or "crevasses," arise in many glaciers. It is these crevasses which make it difficult and sometimes dangerous to cross glaciers.

As the glacier ice moves, it gathers up a great quantity of rock debris and earthy matter from the surface over which it passes, and carries it down the valley or towards the edge of the ice cap. When the glacier melts, it leaves deposits of this debris, which is then called "drift." In some cases rock debris is found on glaciers. If it is arranged in belts, the belts are called "moraines."

Formerly there was a huge ice cap covering a large part of the northern half of North America, an area of some 4,000,000 square miles. Europe had an ice cap at the same time, perhaps half as large, covering the north-western part of that continent. The wear and tear of the surface by the passing ice, and the deposition of the drift which it carried, changed the surface of both continents greatly. Most of the lakes of north-west Europe and of the northern part of North America are due to this ice leaving great hollows in which water later accumulated. (See Ice Age)

#### Gladiator.

"Hail, Caesar, those about to die salute thee!" This was the cry with which the gladiators, or professional fighters of the Roman amphitheatre, saluted the Emperor as they marched past his seat in their procession through the arena before engaging in mortal combat with one another, or with wild beasts, for the entertainment of the populace.

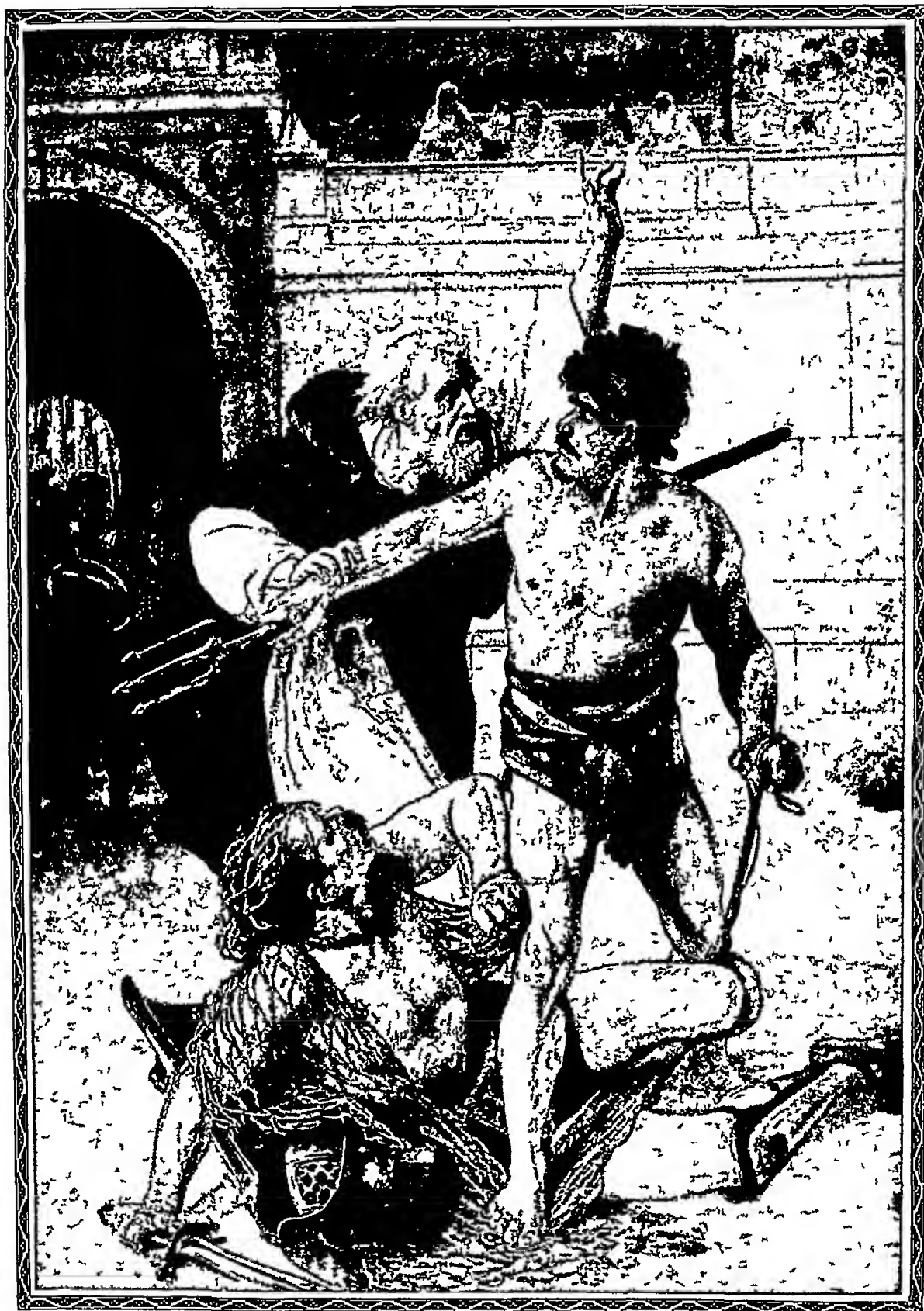
For the most part they were prisoners of war, slaves, or criminals, though some were men of good family or large means who loved fighting for its own sake, or young men of broken fortune. When a gladiator was disabled or dis-

armed, the spectators, by turning their thumbs up (or against the breast) or down, determined the fate of the beaten gladiator. There is doubt about the meaning of these gestures. According to some authorities "thumbs down" meant death, according to others, it was a signal for the conqueror to throw his sword down—in other words, the conquered gladiator was to be spared his life.

There were several different classes of gladiators. Of these, the *bestiarius* fought with wild beasts. The *retarius* was armed with a trident and a net (*rete*), in the meshes of which he endeavoured to entangle his opponent. The *mirmillo* had a helmet adorned with the figure of a fish, and usually had as his opponent the *Thrax*, who wore a Thracian equipment, a round shield and a short sword. The *andabata* fought on horseback and wore a helmet which entirely covered his face. The *laquearius* tried to lasso his opponent.

The custom of giving gladiatorial shows seems to have been borrowed from the Etruscans, and is doubtless a survival of the practice of sacrificing slaves and prisoners on the tombs of illustrious chieftains. The first gladiatorial combat in Roman history took place in 264 B.C., and the fashion rapidly spread. Julius Caesar staged a show at which some 300 couples fought, and the Emperor Titus (A.D. 40-81) gave an

## LAST FIGHT OF THE ROMAN GLADIATORS



It was in the year 404 A.D. during the reign of the Emperor Honorius that this thrilling event took place. The gladiator with the trident and the net had just brought down his heavy-armed antagonist and was about to deliver the death blow. The crowd in the Colosseum watched breathlessly for the fatal thrust. Suddenly the aged monk Telemachus leaped into the arena and in the name of God called upon the victor to stop. Telemachus was stoned to death by the infuriated crowd but his brave sacrifice had its reward, for the emperor forbade gladiatorial combats from that day on.

## GLADIATOR

exhibition of gladiators, wild beasts and sea fights which lasted 100 days, in which 10,000 men and all kinds of fierce animals fought

Such contests were finally stopped in A.D. 404—it is said, through the courage of Telemachus, an Asiatic monk who, rushing into the arena, strove to part two gladiators, just as the victor was about to put an end to his adversary. The spectators promptly stoned him to death, but his bravery had its effect, for the Emperor Honorius suppressed such exhibitions.

**Gladstone, William Ewart (1809-98)**  
For over sixty years Gladstone sat in the House of Commons. For more than half that time he was the acknowledged leader of the Liberal Party. Four times he was Prime Minister (1868-1874, 1880-1885, from February to July, 1886, and 1892-1894), and his name became associated with a great number of political and social reforms.



**GLADSTONE THE ORATOR**

Like many politicians, Gladstone began his career at the Oxford Union where he spoke memorably against the Reform Bill in 1830. He subsequently represented Oxford in Parliament. His speeches seem wordy and pompous in print, but he had a fine voice. This picture shows him speaking at his last great public appearance at Liverpool in 1896.

## GLADSTONE

Gladstone's father was a successful merchant in Liverpool who also owned extensive coffee and sugar plantations in the West Indies. Curiously enough, it was the wealth produced on these plantations by slave labour (before the Emancipation Act of 1833) that enabled his son to devote his life to the cause of human liberty.

When young Gladstone was 11 years old he was sent to Eton, and from Eton he went to Christ Church, Oxford, where he took his degree, a double first, in 1831. Deference to his father's wishes led him to give up his own inclination to become a Church of England clergyman, and to enter political life. To the end of his days he retained his interest in theology and in the classics, and in the midst of a busy political career one of his chief diversions was reading Homer in Greek, and he often wrote on Homeric and religious subjects. He also translated Horace's Odes.

Gladstone entered the House of Commons in 1833, at the age of 24. Less than ten years later he became President of the Board of Trade, with a seat in the Cabinet. In the beginning he was so little of a Liberal that Macaulay styled him "the rising hope of the stern, unbending Tories." He first abandoned the Tories in 1846, when he supported the Conservative leader Sir Robert Peel against the mass of the Conservatives in repealing the Corn Laws. It was not until 13 years later that he definitely joined the Liberal party, of which a few years later he became leader.

One of the spectacular feats which first brought Gladstone fame was the defeat he administered in 1852 to Disraeli, then Chancellor of the Exchequer, in a fast and furious debate over the Budget. With eloquence and great mastery of detail he tore Disraeli's financial scheme to ribbons. The rivalry between Gladstone and Disraeli, who presently became the official leader of the Conservative party, lasted until Disraeli's death in 1881.

In his first period as Prime Minister (1868-1874), Gladstone began to pass his great measures of internal reform.

He secured the passage of a law which for the first time gave state aid to public elementary schools. He opened the Universities of Oxford and Cambridge to men of all religions. He introduced secret voting by ballot at elections in place of the old public method of voting.

But, above all, his name is connected with his measures for Ireland.

Although most of the Irish were Catholics, the Anglican or Protestant Episcopal Church was the Established Church of Ireland, supported by tithes, until Gladstone passed the Irish Disestablishment Act (1869). He also passed the first Irish Land Act (1870), which removed some of the most serious economic burdens from which the Irish peasants were suffering.

Finally, when Gladstone became convinced that the majority of the Irish wanted the Irish Parliament restored, he introduced the first Irish Home Rule Bill. This bill (1886) was defeated in the House of Commons by the desertion of a large group of his followers, who thenceforth were called Liberal Unionists, and Gladstone was forced to retire as Prime Minister. When a change in the elections again brought him to that position, he introduced his second Home Rule Bill (1893), this passed the House of Commons, but was rejected by the House of Lords.

Gladstone's political work was now practically closed. In a short time the "Grand Old Man," now in his 85th year, retired from public life on account of approaching blindness due to cataract. His remaining years were spent at his home at Hawarden Castle in Wales, which had passed into his family by his marriage in 1839 to Catherine, sister and heiress of Sir Stephen Glynne, the Squire of Hawarden. Several times he had been offered a peerage, but he refused the honour, preferring to remain a commoner.

Gladstone was most imposing in his appearance. He was six feet tall, with a great breadth of shoulders and a large head, jet-black hair (in his younger days), deep set flashing eyes, a prominent nose, and a face of extreme pallor. His voice was clear and beautiful, he had a magnificently generous flow of language, and by common consent he was one of the greatest orators of the 19th century. Gladstone used to say that the secret of his success lay in his power of concentrating upon the matter in hand, a faculty he possessed in the highest degree.

After a life of active service prolonged far beyond the appointed limit, and spent either in strenuous labour or in recreations scarcely less laborious (one of his favourite pastimes was cutting down trees), Gladstone could walk to the summit of Snowdon when he had turned eighty. He seemed incapable of fatigue. From work, even the most exhausting, he required only change of occupation rather than rest.



F. Frith

#### HOME OF THE 'GRAND OLD MAN'

Here, at Hawarden, Gladstone lived for many years. It is a modern building, the real Hawarden Castle is a 13th-century ruin near by. In the same village is St. Deiniol's Hostel for theological students, founded by Gladstone.

**Glamorganshire.** The second largest county of Wales, Glamorganshire lies in the extreme south of the Principality, extending to the shores of the Bristol Channel. It has an area of 813 sq. miles.

During the 19th century the development of the rich coal-fields made it one of the most important industrial districts of the country. The chief coal mining area is in the valleys that run down to the sea from the hills in the north of the county, which are a continuation of those in Breconshire. The county has also large iron, steel and copper-smelting works. In the industrial depression which culminated in the financial crisis of 1931 the coal mining districts of South Wales lost much of their prosperity and came to be numbered among the "Distressed Areas."

Most of the southern portion of the county consists of beautiful fertile valleys where the chief industry is agriculture. On the coast of the Bristol Channel Glamorganshire has several seaside resorts, the best-known of which is Porthcawl. The county town is Cardiff (qv). Merthyr Tydfil (population 71,000) and Dowlais are the chief centres of the iron and steel industries, and Swansea (qv) and Aberavon of tinplate manufacture and copper smelting. The Rhondda valley, another industrial area, was once one of the most picturesque beauty spots in all Wales. Population, about 1,225,000.

**Gland.** Every day the human body produces several quarts of liquid. Whenever you cry a liquid called tears flows out between the eyelids. Even if you do not "cry," tears are produced and a drop is distributed over the front of each eye every time you wink. When

you are warm a liquid called "sweat" comes out on the skin. All the time there is the liquid called saliva appearing in the mouth. Where do these liquids come from?

The answer is that they are manufactured by organs of the body called "glands." Each gland takes water and other substances out of the blood and from these manufactures its own kind of liquid, which is called a secretion. The "saliva" is the secretion of the salivary glands, situated under the tongue and jaw. A tube (duct) leads from each salivary gland into the mouth.

In the wall of the stomach are many small glands which discharge their secretion through short ducts into the stomach cavity. These are called gastric glands, and the secretion is called "gastric juice."

### The Largest Gland—the Liver

Situated near the stomach and discharging its secretion into the intestine just below the stomach is the liver, the largest gland in the body. Its juice or secretion is called "bile." There is a pouch, called the gall-bladder, for storing bile. The tube from the gall bladder to the intestine is the bile duct.

Near the stomach is another large gland called the pancreas or sweetbread. It makes a secretion called "pancreatic juice," which flows through a duct into the intestine.

The saliva, gastric juice, pancreatic juice, and bile are all secretions which are useful in the digestion of food. They contain substances, called ferments, or "enzymes," which change complex foods into simpler substances. The saliva, by means of an enzyme called "ptyalin," splits starch molecules into sugar molecules. Each digestive secretion contains its own peculiar enzymes, designed to aid in digesting particular kinds of foods.

### 'Ductless' Glands and What They Do

All the glands mentioned so far, and some others, have ducts by which their secretion is carried either to the outside of the body or into the alimentary canal. But there are in the body certain "ductless" glands. The secretions they produce find their way directly into the blood stream and are carried all over the body. These secretions are called "hormones."

Among the ductless glands may be mentioned the thyroid, the parathyroid, the suprarenal and the pituitary. The uses of all these are not completely understood, but it is known that they influence the activity of one another and of other organs in different parts of the body. This is done through the circulating blood into which they pour their secretions.

The thyroid gland is situated in the neck. It is known that the secretion of this gland has a wonderful influence on the profitable use of food by the body. If a baby has too little thyroid secretion, it does not grow properly but

becomes a peculiar idiotic dwarf known as a "cretin." In adults the lack of thyroid secretion leads to a disease called "myxoedema." Excessive thyroid secretion is as bad as too little, and causes a disease known as "exophthalmic goitre," characterized by cardiac symptoms and protruding eyeballs.

The secretion of the thyroid gland contains a substance called "thyroxin," which is a complex chemical compound containing iodine. The suprarenals situated above the kidneys, secrete a substance called "adrenalin," which helps to maintain the tonicity of the blood-vessels. Thyroxin and adrenalin are examples of hormones.

The pituitary is situated at the base of the brain. It is derived in early stages of development partly from the nervous system and partly from the pharynx. Owing to this fact it has a double function. It has much to do with the proper growth of the young. It also affects muscles and some glands. Particularly it regulates the secretion of urine and of milk. Diseases related to the pituitary may be due to excessive or deficient secretion of the gland.

The parathyroids are four tiny bodies embedded in the thyroid, but are quite distinct in function. Their secretion has something to do with the growth of bones through their governing influence over calcium (lime) metabolism. The ductless glands are very important to the body. Removal of the pituitary, suprarenals, or parathyroids, although they weigh only a fraction of an ounce, causes death in two or three days.

Some of these glands possessing ducts also produce internal secretions in the manner of the true ductless glands. The pancreas is such a gland, and its internal secretion has to do with the use of sugar by the body. The name of this secretion is "insulin," which can now be prepared, following its discovery by Drs. Banting and Best at Toronto, from extracts of animal sweetbreads. "Diabetes mellitus" is a disease in which the body cannot utilize normal sugar of the blood and liver, and it is in great part due to some change in those parts of the pancreas called the "islands" of Langerhans which normally elaborate insulin. (See *Liver and other body organs*.)

**Glasgow, SCOTLAND** Smoke from the giant chimneys of scores of factories, a deafening clatter from thousands of hammers pounding on cold steel, miles of shipyards lining each side of the river with forests of masts, acres of hulls, and skeletons of many vessels, and, winding in and out among nine miles of quays and docks steamers old and new flying the flags of every nation—this is Glasgow, Scotland's industrial and maritime metropolis, which is not only one of the greatest manufacturing cities, but also the chief shipbuilding centre of Britain.

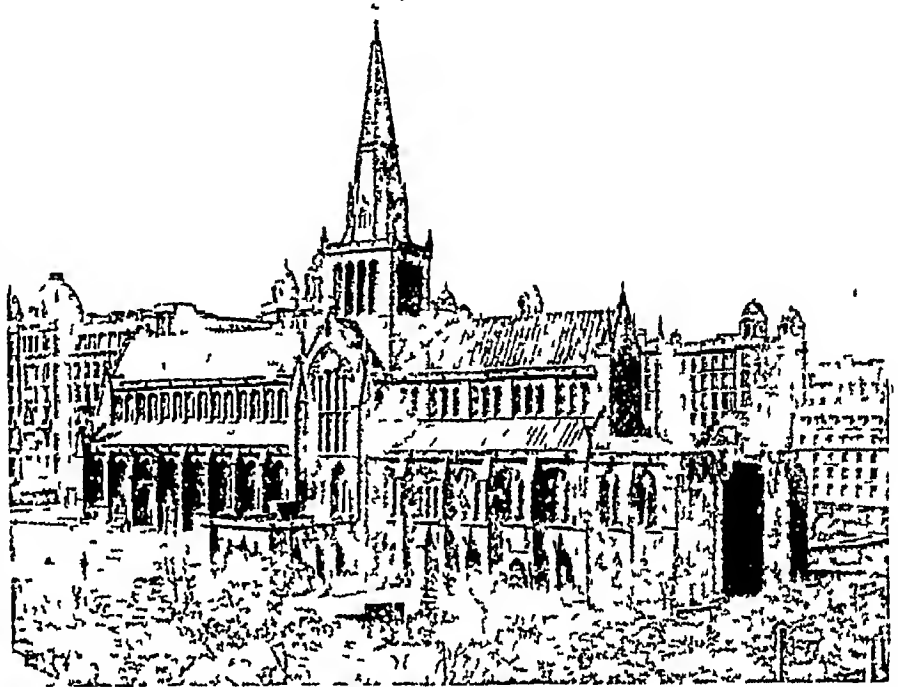


## GLASGOW

"Glasgow made the Clyde and the Clyde made Glasgow" is one of the true sayings of this city. Many years ago Glasgow was only a small marsh village, but the people determined to have a port. They began to deepen, widen, and wall in their river Clyde, which was then only 3 feet deep. The city today—which, next to London, is the largest in Great Britain—has a fine artificial harbour, costing over £8,000,000. In the great shipbuilding yards at Clydebank, six miles from Glasgow many famous ships have been built, including the Queen Mary, launched on September 26, 1934. (See illustration in page 1074)

With its excellent connexions by road, rail, and water, this commercial capital of Scotland—built right in the midst of great iron- and coal fields—makes good use of its opportunities.

Besides shipbuilding, and the making of all kinds of machinery, the city has important cotton mills, textile factories, calico printing and dyeing works, and distilleries. Its chief exports are cotton, linen, and woollen goods, machinery, coal, chemicals, paper, and whisky. The western Highlands are within easy reach.



Photos Annan

### GLIMPSSES OF GLASGOW, ST MUNGO'S CITY

A Cathedral was founded in Glasgow in the 6th century by Kentigern, patron saint of the city, but the present building (top) was erected much later, from the 12th to the 15th century. Kentigern's grave is in the vaults; he was also known as Mungo ('well-beloved'). The lower photograph shows Sauchiehall Street, Glasgow's shopping centre, flanked by fine shops and cinemas.

The old part of Glasgow slopes down to the river—on the north side—here called the Broomielaw—and the new part is on the higher background and on the south side. Glasgow is known as one of the world's best governed municipalities, and its people are justly proud of the excellent municipal tram service extending far out into the suburbs. One of the few ancient buildings is the cathedral, which was built between 1197 and 1446. It is well situated on a hill to the north-east of the city, and

is the completest and, next to Jedburgh Abbey, the finest example of Gothic architecture in Scotland. The Glasgow Art Gallery and Museum in Kelvingrove Park is a magnificent pile in red sandstone and, after the National Gallery in London, it has the finest collection of pictures in the British Isles.

The University, founded in 1450, is the second oldest of the four Scottish Universities. In

George Square are the municipal buildings, erected at a cost of £800,000, the Scott Monument, and several statues of famous people.

Glasgow's oldest open spaces are the Green in the east of the city, Kelvingrove in the west, and Queen's Park in the south. The city's water supply is obtained from Loch Katrine 30 miles away. The population of Glasgow is 1,088,000.

## The MAGIC ART of the GLASS-MAKER

*Is it not wonderful stuff this glass—clear as water, yet sometimes as strong as steel, a necessity to every house, and the luxurious ornament to the rich man's table, a most ancient, yet very modern, material?*

**Glass.** No one knows just where or when men first found out how to make glass, but the story told by Pliny the Elder suggests how the discovery may have been made. In long forgotten days, according to this Roman naturalist's account, the crew of a Phoenician ship voyaging from Egypt to Syria had built a camp fire on a sandy beach of Palestine, near Mount Carmel.



Specimens of white Venetian glass from the British Museum

To prop their cooking-pots they took from the ship's cargo pieces of natron, a crude form of soda, used in those days in embalming the dead. Lo! next morning in the ashes they found shapeless lumps of glass, formed by the fusing of the sand and the soda. This at least is certain, that the Egyptians and other ancient peoples had learned to manufacture vases, cups, and beads of glass at least 4,000 years ago.

From Egypt the knowledge of glass-making spread to neighbouring lands of the Mediterranean. It was introduced among the Romans about the beginning of the Empire, though glass had long been imported. As the art declined in Rome with the decay of the Empire, it was transferred to Constantinople, where it flourished during the Middle Ages.

The Arabs obtained a knowledge of glass making, and the glass of Damascus was widely celebrated. Venetian glass, also, early became famous, and mirrors, goblets, and cups from Venice were very highly-prized and sent all over the known world.

Glass today is made from practically the same materials as that used several centuries ago. Glass consists of 60-70 per cent (or more) of silica (sand), 10-15 per cent (or less) of soda, up to 15 per cent of potash, with minute

quantities of other ingredients. The best English crystal glass contains no soda. In modern glass factories the mixture is melted either in special fire-clay crucibles for the finer grades, or in large tanks built of fire clay slabs. These tanks are rarely more than 3 feet deep, but are often of great extent, holding 200 tons or more of the mixture at a time. The walls of the surrounding furnace are built of nearly pure silica, for even fire clay cannot withstand the terrific heat (1300°-1500°C) necessary to melt glass.

Just before the mixture of finely ground sand, soda, lime, or other ingredients is put into the crucibles or the tank, a mass of broken glass called "cullet" is added to speed the fusion. As the melting proceeds, the mixture foams and bubbles until it becomes almost as liquid as water. Impurities are then skimmed off the surface, the mixture is allowed to cool until it is "sticky," and blowing or moulding begins.

The larger glass factories do all the actual moulding and blowing by machinery, but some of the finest grades of glass are still made by the old "mouth-blowing" methods. Suppose the task in hand is blowing window glass. The "gatherer" dips the bell shaped end of a 5-foot blow-pipe into the "soup," as he calls it, and a small ball of glass sticks to it. He puts his mouth to the other end and blows, forming a thick-skinned bubble. He dips this into the molten glass again, and blows the bubble bigger. Four or five times this is repeated, until the soft bubble is as big and heavy as a water melon.

Now the pipe with its bubble passes to the "blower," who is the real expert. He puts the bubble in a moulding block, and blows and turns until it becomes long and pear shaped. When this moulded glass becomes too cold to expand readily, it is reheated in a blow furnace.

Then the blower mounts a bridge built across a deep "swing hole." He swings the pipe with its hanging mass of glass to and fro, blowing all the while, until it is drawn out into a long cylinder with thin even sides. When this has cooled, the ends are cut off by wrapping a hot

## GLASS

glass thread round them and touching this with a cold iron. Immediately a crack runs round the cylinder in the path of the thread.

The open cylinder is now laid in a cradle, a hot iron is drawn down one side in a straight line, a cold iron touches this line, and the cylinder is split lengthwise as neatly as you would cut a sheet of paper with scissors. Finally the sheet is heated and flattened, and stored away to be cut into window-panes.

The compressed-air machine blowers perform the same tasks as the mouth-blower, but they handle much larger quantities of glass, and produce much longer and broader cylinders. Bottles are now generally blown into moulds by automatic machines, some of which turn out 50,000 a day.

In making plate-glass, the molten glass is dipped up from the tanks in big pots attached to cranes and poured out upon large iron tables, which have adjustable rims as high as the desired thickness of the glass. There it is rolled out smooth, like dough under a rolling-pin. The coarser grade, used in skylights, is then ready for final cooling. The finer grades, for shop windows, mirrors, etc., are carefully ground under iron blocks, then polished with felt and a powdered oxide of iron called "rouge." Thus glass is obtained which is uniform in thickness and which does not distort the view as does ordinary window glass.

The "blanks" from which cut-glass articles are made are first pressed into shape in moulds. The patterns are then marked out with chalk, ground out with sand and emery wheels, and the ground surfaces polished with putty powder. In the cheaper grades, the pattern is pressed into the glass in the original mould. The edges are then ground and the surfaces polished until it is difficult to distinguish the two grades.

Various safety glasses, called "unsplinterable" or "laminated," are used in motor-cars, especially in windcreens, and in ships, aeroplanes, etc. A usual method is to make a

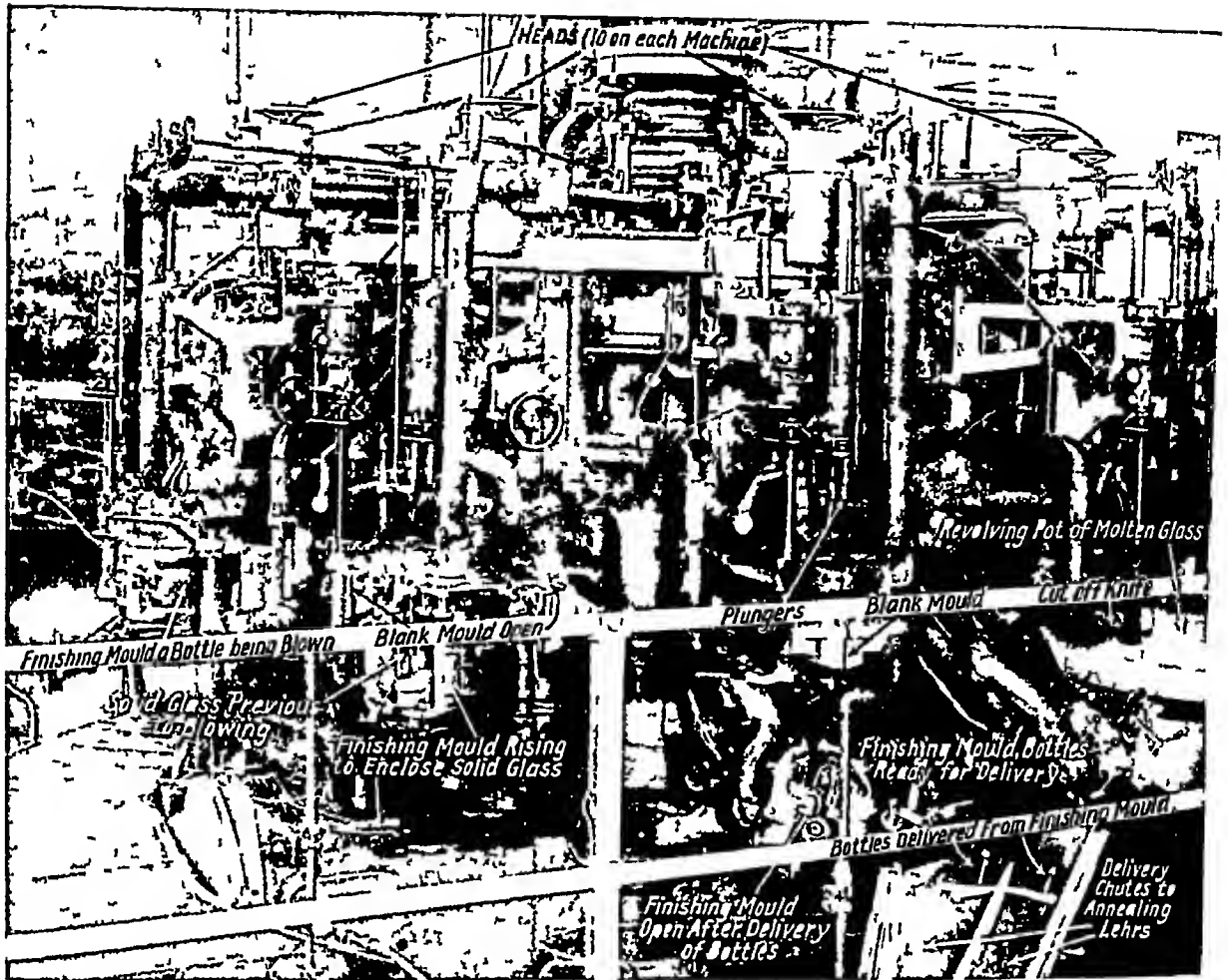


### GLASSWARE OF GRACEFUL APPEARANCE

Phoenician glass (in the top picture) consists mainly of vessels, like these phials, vase and jug found in Syria, Cyprus, and Rhodes. Painting on glass is a delicate art, as in the 14th-century Persian beaker on the right, from the Eumorfopoulos collection. The lower left hand photograph shows examples of three of the main periods of English drinking glasses.



## GLASS



### MAKING BOTTLES FROM THE MOLTEN GLASS

The amazing machine illustrated above will manufacture almost any type or size of bottle. It revolves round a central axis, and  $1\frac{1}{2}$  revolutions are all that is necessary to form a complete bottle from start to finish. As can be seen, there are ten "heads," and each of these is capable of carrying out its cycle of operations at the same time. Each "blank mould" sucks up a charge of molten glass from a revolving circular pan, and afterwards a "blow mould" blows the bottle.

Courtesy of United Glass Bottle Manufacturers Ltd

sandwich of a piece of celluloid, or pyroxylin plastic about one fifteenth of an inch thick between two sheets of flat glass. Dehydrated gelatine, that is, gelatine from which most of the moisture has been removed by heat, provides a cement that does not streak or cloud. Each sheet of glass is only one eighth of an inch thick, so the completed plate is little heavier than ordinary glass. This "sandwich" glass, when broken, adheres to the plastic instead of flying about. "Bullet-proof" glass is a sandwich of thick glass and transparent strips of pyroxylin, usually with two layers of each. "Tempered," or "flexible," glass is made by heating sheets to about 1500 degrees Fahrenheit, then chilling them with a blast of cold air. The outer surfaces contract, putting the inside under tension.

"Wire glass" is made like plate glass, except that the heated wire screen is pressed into the middle of it while the glass is still soft. "Ground" and "frosted" glass is produced by making one of the surfaces rough, so that although light passes through, it is so diffused that the details of objects are not visible.

Though glass appears under most conditions very rigid and brittle, it can be drawn into strands almost as fine as a spider's thread and nearly as flexible as silk. Such "spun glass" is usually made by melting the end of a glass rod, drawing out a thread from it as you would draw toffee, and fastening the end of this thread to the rim of a large wheel. While the rod is held in the flame to keep the glass soft, the wheel is revolved rapidly, drawing out the fine thread and winding it up at the same time.

The bright golden hair of many of the best china dolls is spun glass, and cloth can be woven from it. "Mineral wool" is a similar form of glass fibre, produced by turning compressed air or steam upon molten glass.

Coloured glass is made by adding small amounts of various metallic oxides to the usual material. Chromium gives green shades, manganese, shades from pink to purple, copper yields reds and blacks, uranium, yellows and greens, cobalt, a great variety of blues. The best "ruby" glass is made by adding a tiny quantity of gold, which is held in suspension

# SOME SCENES FROM THE STORY OF GLASS-MAKING



The melted glass is ladled into iron pots (upper right) Then hollow blowpipes are dipped into it and gradually raised by machinery, drawing with them great cylinders of glass 40 or 50 feet long These cylinders are lowered into cradle-like rests and cut up by hot rods The sections are again heated in open ovens (lower right) and ironed into flat sheets. The men in the lower left-hand picture are blowing glass by the old mouth-blowing method and the man in the oval is cutting table glass on an emery wheel.



in the form of a powder so fine that it can be seen only with the ultra-microscope. To reduce the expense, only a thin coating of ruby glass usually is applied to a sheet of clear glass.

Even plain clear glass varies greatly in its composition, and its properties depend upon the "base" chosen to mix with the silicate, as well as upon the treatment it receives in the making. For example, lead and barium give weight and brilliancy, and increase the softness during the manufacture.

Magnesium and aluminum give a glass which stands red heat without softening. "Crown glass," which contains soda, has a very brilliant surface; it derives its name from the process of blowing. "Flint glass," also called "crystal glass," contained lead, but received its name from the fact that its silica was obtained from powdered flints; the term is now applied to almost any clear colourless glass.

The most difficult tasks of the maker of fine glass are, first, to obtain pure chemicals and mix them in the proper proportions, and second to temper or anneal his glass properly when it is cooling. Glass mixtures are extraordinarily sensitive to changes in chemical composition. A minute quantity of iron, for instance, in a big "batch" of plate-glass may discolour it all, and, once the mixture is melted, there is no way of removing the offending chemicals; the whole mass must be thrown away or used for some inferior purpose. Or, perhaps, the maker of "flint" glass has put in an extra quantity of the lead oxide which gives it its brilliancy, and several months later the cut glass bowl he has fashioned tarnishes to a dull and dirty hue.

Even if the mixture is exactly right and the article is blown or moulded to its proper shape, the whole may be spoiled by allowing it to cool too quickly. Glass, as you know, is an extremely



LOVELY STAINED GLASS

Some of France's finest stained glass is in the 13th-century cathedral at Chartres. This window shows St. Denis blessing a knight about to set out on a Crusade.

poor conductor of heat, and when boiling water is poured in a tumbler it cracks. This is because the inside gets hot and expands quickly, while the outside remains cold and contracted. Some fine grades of glass are cooled over a period of many weeks to give them the proper temper. Certain "low expansion" glasses have been produced such as Pyrex oven ware, lamp-glass, Jena glass, thermometer glasses, etc., which may be plunged while almost red hot into cold water without cracking. These are valuable for baking-dishes, chemical apparatus, water gauges in steam boilers, and for a large number of similar purposes.

It is in making the high grades of optical glass that the most careful science is called into play. Certain chemicals, principally compounds of barium, boron, magnesium, lithium, and phosphorus, when added to the ordinary ingredients, alter greatly the effect of the glass upon the light rays that pass through it.

For generations scientists who used microscopes, telescopes, photographic apparatus, etc., had been handicapped by the optical defects of lenses made with ordinary flint and crown glass. In 1881, however, two physicists in the town of Jena,

Germany, began a series of experiments which resulted in the production of about 2,000 new kinds of glass, more than 70 of which have proved of immense value in lens making. The others are prized for their colour, toughness, etc.

The first steps in making glass for lenses are like those used for ordinary glass, but the heating is carried to about 2,750° F., in order to melt the chemicals added to the usual formula. Also, because optical glass must be almost entirely free from bubbles, special stirring is required to eliminate them. The pot in which the glass is melted cools for a week, during which the glass contracts and breaks into

regular pieces, like ice blocks. Only the best pieces are selected to be reduced to the plates from which the optician makes his lenses and prisms. These choice pieces are remoulded in separate reheating furnaces. When the mass has assumed the shape of the mould, it goes through the final annealing process, a slow cooling that lasts for weeks, or, if the pieces be large, for months. Even with all this care, only about 15 per cent of optical glass survives from the original batch of materials. The rest is used for ordinary glassware.

During the World War, when the supply of Jena optical glass was cut off, other countries made great strides in the domestic production of optical glass for telescopes, field glasses, periscopes, and similar instruments. France outstripped all other countries in the making of artistic glassware.

British and American inventors have skilfully developed the mechanical side of the industry, producing machinery which greatly aids the manufacture. Cheap fuel (especially natural gas) and a plentiful supply of the right kind of sand are essential.

Not the least of the glories of the Gothic cathedrals with which the Middle Ages enriched Europe were the vast stained glass windows whose storied radiance flooded the dark interiors with brilliant colour. In large part, the art which produced them is now lost to the world.

In producing such a pictured window, the artist worked out his design by means of a "mosaic" of pieces of coloured glass set in outlines of lead. The delicate shadings of draperies, the lines of the figures, etc., were produced by painting with colours made from metallic oxides mixed with oil of turpentine.

Finally the colours were fixed by firing—that is, the glass was placed in an oven, and the pigments were fused into the glass by heat, so

that the colouring was made both translucent and permanent. Thus have some of the most glorious colours been produced by Man.

**Gliders AND GLIDING** There were gliders before there were aeroplanes, because men found out the basic principles of flight before they evolved a suitable engine to keep their flying machines in the air.

Nowadays gliding is largely a sport, although in some countries it is regarded as a suitable preliminary to learning to fly an aeroplane. Especially is this the case in Germany, where in the years following the World War pilots who would have joined an Air Force, had there been one, directed their enthusiasm instead towards the problems of gliding. The Germans still lead in the gliding world, their pilots and machines hold the majority of the world's records (flights of over 300 miles and 36 hours in duration have been achieved), though a great advance has been made in Russia.

English gliding is now financially assisted by the Government, and the leading centres of the sport are Dunstable Downs in Bedfordshire and at Sutton Bank in Yorkshire. Here novices are launched from the lower slopes of a hill on "primary" gliders, until by easy stages they have gained in experience sufficiently to be launched from the top in a high efficiency sailplane, in which the expert pilot can stay up for several hours and can actually climb by taking advantage of suitable air currents.

The essential controls of a glider are the same as those of an aeroplane—rudder, elevators, and ailerons. There are, of course, no wheels, but it is only rarely that a glider is damaged by a bad landing.

**Gloucestershire.** One of the western counties of England, situated about the estuary of the Severn, Gloucestershire falls into three natural divisions of valley, woodland, and hill.



**HOW A GLIDER IS LAUNCHED INTO THE AIR**

An elastic cable is passed through a ring hooked to the machine, the tail of the glider is held down, and the launching party, who are out of sight in this photograph, walk in front with the cable until it is drawn out to about twice its normal length. The tail is then released, the glider is catapulted into the air, and the cable and ring fall to the ground. Some pilots, however, prefer to be drawn by a motor-car moving rapidly down a slope.

The Cotswold Hills, in which rises the river Thames, stretch across the western part of the county from south to north, and reach a height of 1,135 feet in Cleve Hill. The vales of Berkeley and Gloucester, excellent meadow lands, extend through the centre, the former being noted for its cheese. The woodland area is represented by the beautiful hilly Forest of Dean, whose area is about 35 square miles, and part of which is a coal-field.

In addition to the Thames and the Severn, which traverses the county from the north, the more important rivers are the Upper and Lower Avon, the Wye, on the Monmouth border, the Frome, and Colne. The Severn Tunnel shortens the rail journey between Bristol and Cardiff. Cattle rearing and agriculture are important. The area of the county is 1,243 sq miles.

Gloucester is the county town, but Bristol, part of which is in Somersetshire, with a population of over 409,000, is by far the largest city, and also the principal port. A navigable canal joins Gloucester to Bristol.

The city of Gloucester (population 52,900) has engineering and railway works, flour mills, and other industries. It has a fine cathedral, mainly Norman, which was originally the church of a Benedictine monastery founded in the 11th century. The Festival of the Three Choirs (Gloucester, Worcester, and Hereford) is

held in it once in every three years. The population of the county is 785,000. Other towns in the county are Cirencester, (the Roman *Corinium*), Cheltenham (*q v*), and Tewkesbury, where a battle was fought during the Wars of the Roses (1471).

**Gloves.** Kid, silk, hse, and cashmere gloves for dress and leisure wear, buck skin and dog-skin for riding, driving, and heavy uses, rubber gloves for surgery, electrical work, and housework, cheap cloth gloves for any rough task—there are gloves for every use and every occasion. But the two main classes are leather and fabric gloves.

Leather gloves are made of skins of deer, sheep, lamb, goats, and kids, but the name of the glove does not always tell the animal from which it came. While French kid is considered the finest glove material, more "kid," "doe skin," and "buck-skin" gloves are made of lamb skin than of kid skin or deer skin. "Chamois" gloves, too, are made from the inner layer of split sheep skin or lamb skin, tanned with fish oil to make the material washable. The so-called English "dog skin" or "Cape" gloves are made from the skins of sheep obtained from the Cape of Good Hope.

"Mocha" gloves are made from Arabian sheep skins, first shipped, it is said, from the port of Mocha which gives its name to Mocha coffee. The mocha finish produces a leather much like "suede" or undressed kid in appearance, but stronger, it is produced by "buffing" or "friezing" the smooth surface from the hair side, whereas suede is finished on the flesh side. The finest grades of wool usually grow on skins which are much inferior to those which produce heavy, wry wool. The best skins for gloves used to come from Russia, other varying grades come from Spain and eastern Europe.

The dried skins, when received, are soaked and softened in lime water for two or three weeks, cleaned of hair and flesh, cured by the process necessary for the particular kind of glove desired, dyed, and given the required finish. The "glacé" finish is produced by sizing the grain or hair side.

The prepared skins are next divided into "trunks" or slips, and each trunk is cut by machine operated dies into a glove ready for sewing the scraps being used in making the strips for the inner sides of the fingers, etc. Fine dress gloves are sewed over and over



GLOUCESTER CATHEDRAL

The oldest part of this fine cathedral dates from the 11th century, and the tower was built in 1450, but an abbey was established on the site as early as 681. The cathedral contains the shrine of Edward II, whose body was brought here after his murder. The famous Three Choirs Festival takes place here.

J. Dixon Scott

## GLOVES

("overseam" or "roundseam"), heavy walking gloves may have one edge lapped over the other (*pique*), very heavy gloves have the edges brought together like an overseam but are sewn through and through ("prick-seam" or "saddlers' seam"). Machines for sewing gloves were not invented until 1875, though they were long resisted by many of the best manufacturers, most gloves now are machine sewn.

Fabric gloves may be made of silk, lisle, cotton, or cashmere or other wool yarn. They may be knitted without seams, or stamped out of a fabric knitted with a special stitch which does not ravel when cut. They are cut and

sewn somewhat as are leather gloves, but in larger sizes, being shrunk to the proper size after cutting. Knitted gloves and mittens are made in a number of hosiery mills.

In spite of the introduction of machinery, leather glove making continues to be a highly skilled occupation. French gloves have long had a high reputation, and the finest French gloves have come for centuries from Grenoble, Paris, Niort and Vendôme. Copenhagen and Brussels are other continental glove making centres. The great English glove centre is Worcester. In the United States, the industry is carried on chiefly in New York State, especially in the towns of Gloversville and Johnstown, where it has existed since 1760.

**Glucose.** Glucose is a very thick liquid, usually light amber in colour, and about two thirds as sweet as sugar cane syrup. Many plants transform starch into glucose, and honey consists largely of glucose collected by bees.

Since glucose does not readily crystallize it is especially useful in preserving and canning. Cheaper grades of confectionery are nearly all glucose, and the best grades usually contain glucose to keep the sugar from graining.

Scientists once argued over the wholesomeness of glucose, but food experts of the Government have repeatedly declared that it is a



## TWO STAGES IN GLOVE MAKING

Though gloves are still sometimes made entirely by hand, most are now at least sewn by machinery. Left a man is cutting the leather into pieces from which the glove shapes will be stamped out while on the right the two halves are being stitched together by a machine. Glove-making has been for centuries an important industry in Worcestershire.

(Courtesy of Deane Allcroft & Co.)

valuable aid to health. It requires practically no digestion, being absorbed by the blood directly from the intestines, and is then burned by the tissues to furnish heat and energy; it is therefore used, especially in the form of sweets or tablets, for small children and persons whose energies are low through illness or its effects. (See also Sugar)

**Glue.** Strictly speaking glue is an adhesive made from the bones, skins, and sinews of animals, but the name is often applied to adhesives made by altering the starch obtained from such plants as maize, arrowroot, cassava, and potatoes, into a sticky gum. True animal glue is impure gelatine. (See Gelatine)

The manufacture of bone glue starts with crushing the bones, and extracting the fat by boiling in naphtha or some other solvent. Pressure steaming then dissolves out the glue. The solution is clarified, bleached, thickened by evaporation, and allowed to set. Then it is sliced and dried.

What is known as hide glue is made from clippings of skins and other packing house waste. These are steeped in lime and then boiled. Fish glue is made from fish skins and bladders and other fish offal. Waterproof glues are made from casein or from blood albumin. Liquid glue is kept fluid by adding an acid. Elastic glue, used

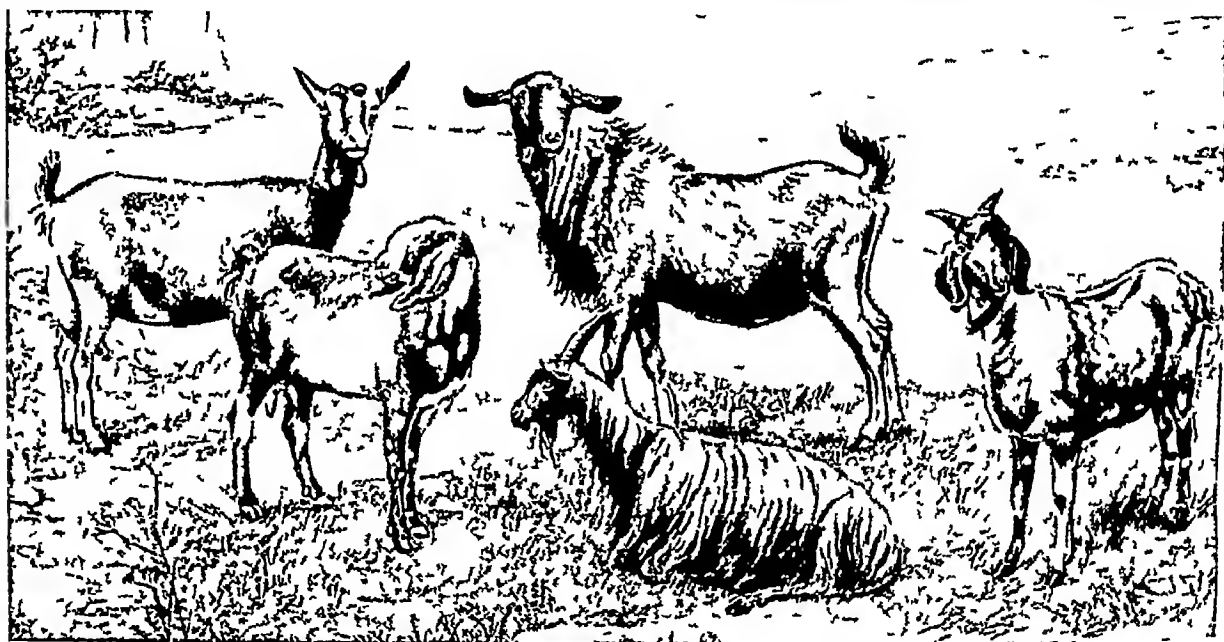
in making printers' rollers and for other purposes, contains glycerine. The sizing which paper-hangers put on plastering before pasting on wall paper is a thin solution of glue and water. The uses of glue are innumerable, it is still important in all joinery and cabinet-making, and few adhesives are so reliable and strong.

**Glycerine.** A chemist would call glycerine (or glycerol, as he terms it) a tri-hydric alcohol ( $C_3H_5(OH)_3$ ), but in spite of this formidable name it is a very common and a very useful substance, without intoxicating properties. It is found in all true fats and oils, and, a product of alcoholic fermentation of sugar, it occurs in such fermented liquors as wine and beer, although to a slight extent only. Much glycerine is obtained as a by-product of the manufacture of soap. (See Soap)

Pure glycerine is a colourless, odourless syrup. It is very sweet (hence the name, from the Greek *glykys*, "sweet") it is heavier than water, and will mix in all proportions with

water, and yet it will burn. Glycerine will dissolve many substances, resins especially, and large quantities are used in toilet preparations, such as soaps, face creams, and washes. The largest use of glycerine, however, is for making nitro-glycerine, dynamite, blasting gelatine, and smokeless powders. The great scarcity of edible fats in Germany during the World War was due to the amount of fats used for the manufacture of these explosives for military purposes.

**Goat.** Though the goat has long borne an evil reputation, it is far from deserving it. Few domestic animals are of greater service to Man. It gives nutritious meat and wholesome milk, fine leather is made from its hide, and an exceptionally strong durable cloth from its hair, it is extremely hardy, and, most important of all, can grow fat on coarse vegetation on which other animals would starve. Part of the goat's evil reputation doubtless comes from the strong odour and surly temper of the males, and from the frequently acrid taste of the flesh and milk.



SOME BREEDS OF GOAT

Perhaps you never realized that there are more kinds of goat than one, yet these are only a few of the many kinds found throughout the world. From left to right those above are the Toggenburg, Nubian, Anglo-Nubian Irish (in front) and an Anglo-Nubian goatling. Left photo, a young Angora doe.



Goats, which belong to the genus *Capra*, are closely allied to sheep, but can usually be easily distinguished by the lighter build and longer, straighter hair. Wild goats are found only in Europe, northern Africa, and the Himalaya Mountains. Of the various species the ibex is the most interesting. The Rocky Mountain goat of North America is classified between the antelopes and the goats. (See Antelope)

Domesticated goats (*Capra hircus*), which are thought to be descended from the wild goat of





### BULL-WORSHIP IN ANCIENT EGYPT

The Egyptians worshipped a multitude of deified animals among the most familiar are Khopri, the scarab beetle; Sobastus (the cat); Thoth (the ape or ibis); Horus (the hawk-headed god) and Aps (the bull). In this picture an Egyptian king is seen making an offering to Aps.

Persia have been bred in many parts of the world from the earliest times. The Angora goat, named after Angora in Asia Minor, has a history that may be traced back to Old Testament times and came originally from much further East. This type has long spiral horns, and in abundance of long white silky hair from which a strong cloth is made, called mohair.

Milch goats are found in all European and Asiatic countries the Toggenburg and Saanen breeds of Switzerland being the best. From the Cashmere goat's beautifully soft silky undercoat are made the famous Cashmere shawls. These Cashmere shawls are exceedingly costly, for it takes the fleece of ten goats to make one shawl a yard and a half square, and the weaving, which is all done by hand takes about a year. Some patterns have been sold for as much as £300.

The hides of young kids are used extensively for gloves and shoes, though much of the so-called kid leather is an imitation made from the skins of rats and dogs. The skin of the Angora, with the hair intact, is often used for rugs and robes. Goat-skins are also used in the manufacture of shoes, portfolios, morocco for book bindings, and other articles. In Britain, you most often see goats tethered on rough commons or along railway embankments for they do well under conditions unfit for other useful creatures.

**Gods.** Were you to walk through the British Museum in London or, indeed, almost any large museum of note, you could hardly fail to be impressed with one outstanding fact. In almost every gallery, lining the walls of many of the corridors, are gods—gods of all kinds, shapes, sizes and ages, gods fearsome and gods beautiful gods carved in stone or shaped in wood, all of them witnessing to an instinct which has been ever present in the inmost heart of Man, whatever his race or colour, or his place in the history of the world may have been.

Long ago, in the beginning of things, as soon as Man became developed sufficiently to realize his own existence and to begin to question the reason for it, so soon did the conception arise of the existence of some Being or Beings beyond his ken, endowed with greater powers than he himself possessed.

Ignorant of the factors that bring the sun and the rain and the frost in their natural seasons or that cause the flowers to blossom and the fruits of the earth to ripen or that visit him with sickness and with death, primitive Man has everywhere invented super-

natural beings to account for these phenomena. Sometimes the sun and the rain were themselves personified and worshipped as gods, and their help was sought when needed. Such beliefs are still to be found among primitive tribes in remote parts of the earth though paganism (as it is called) is everywhere giving way.

But in very few cases do these primitive folk actually worship the stone or wood of which their idols are made. It is rather the spirit which the idol represents or embodies that they venerate. Nevertheless, they do sometimes believe that the spirit lives in the stone or wooden idol and nowhere else, for they will carry their idols with them when they go to war, or on journeys, and may flog the idol if their god does not give them luck.



### GODS OF PRIMITIVE FOLK

The religion of certain African tribes probably resembles the first beliefs of Man. Above, for example, are African idols of hunting and fertility with a ceremonial mask between them.

These primitive gods closely resembled the men who created them, for they knew spite and anger and jealousy, and had to be placated by offerings and sacrifices. Even the gods we read

of in Homer plotted and quarrelled and flirted like human beings

One of the earliest civilizations of which we have any real knowledge is that of Egypt. As was only to be expected in a nation whose development was so advanced, the Egyptians had a conception of the Divine much more rational than that of the primitive savage.

The chief characteristic of the Egyptian worship was however the number of gods which they worshipped. Every kind of living creature was deified, from the bull to the insect.

Greek civilization, which reached its height considerably later than that of Egypt, also demanded polytheism, or the worship of more than one god. So much was this so that we read of St. Paul's discovery in Athens of an altar to 'The Unknown God'—thus in case there was one they had omitted. Their conception of the Divine was considerably in advance of the Egyptian but their gods also were endowed with special qualities and powers.

As in their daily life the ancient Greeks admired beauty and strength so we find the same characteristics attributed to those whom they worshipped. As yet however there was no conception of a single Supreme Being or of One who was all wise and all powerful. So too with the Romans.

The Christian belief that there is but one omnipotent God we owe originally to the Jews. The early Jewish belief was in a god of their own tribe, who was more powerful than the heathen gods. When we pass to the later Indian period we are lifted at once into something infinitely higher than anything before. The one God whom they worshipped was called variously Jehovah, Juh and Elohim. But He was a God who was possessed of infinite wisdom and power, who had created the earth and all mankind.

The prophets of Israel made two remarkable contributions to mankind's belief in God. In the first place, they taught that the Supreme Being was just and righteous, that He could see into the hearts of His creatures, understanding their actions, and fathoming the motives which prompted them, and that He could not be turned from His purpose by sacrifices.

In the second place, Jehovah was not merely the God of the Jewish race, reserving for them alone His favours, but the God of the whole world and of every living creature.

It was reserved for Christianity, however, to introduce the belief in the Divine Fatherhood. The coming of Christ altered entirely the conception of a God who was merely just and righteous. Christianity substituted a God of infinite love and patience, a Father who was ever ready to forgive His children for the wrong they had done, and to help them to set their feet in the right path.

The ideal set by the Christian religion was to do good for the sake of doing good, to be holy because of the beauty of holiness. As a pattern and example, the world was given Jesus Christ, the Son of God, who came to establish the kingdom of Heaven upon earth. He taught the doctrine of the after life, that the soul would not perish with the body but rise triumphantly into communion with God.

In less than 2,000 years Christianity has found its way into the most remote corners of the globe. Its missionaries have carried its gospel into the heart of darkest Africa as into every other continent. The number of its adherents is steadily increasing and include almost the whole of the white races.

Its founder declared that it would attain universal sway. 'I, if I be lifted up, will draw all men unto Me.'

**Goethe, Johann Wolfgang** (Pronounced) (1749-1832). Goethe, the great German poet once said that he "lived" his poems and that they made up "a great confession." He meant that he found life so interesting, and even small happenings so full of meaning, that when he had caught the secret of the interest or had come to understand the meaning, his joy or sorrow had turned into something that became a poem or a story. His zest for life and his lively imagination he inherited from his mother. From his father he inherited a certain sedateness and staidness.

Goethe's greatest work, 'Faust', a dramatic poem in two parts, is in a special sense the "confession" of his whole life. From early youth when he learned the story of Dr. Faustus from a puppet play, until he penned the last scene shortly before his death, there was scarcely a period of his life in which Faust was entirely out of his mind, scarcely a period that did not add something to the great work that was growing under the poet's hand. Faust desires all knowledge, to squeeze the lemon of life dry. Unsatisfied by the results of his studies, he turns to magic. He conjures up the evil demon Mephistopheles and makes an agreement with him. In Goethe's 'Faust' Mephistopheles must gratify Faust's every wish, if he can satisfy Faust, Faust's soul is to belong to Mephistopheles. Faust learns that pleasures are not happiness. His wishes become purer, and reach their highest point in a grand project that is to benefit others. The moral height he has reached calls the powers of Heaven to his aid, and in response they wrest his soul from the demon.

Goethe's other great work was his novel "Wilhelm Meister." Thus, too, Goethe wrote at various times, changing the plan from time to time. But through it all Wilhelm Meister is seeing life and learning in the school of experience. Life is the best teacher. Goethe

# GOETHE—MASTER MIND OF GERMAN LITERATURE



This striking statue of the great poet, dramatist, and philosopher—Johann Wolfgang Goethe—stands in the gardens of the Borghese Villa in Rome to commemorate Goethe's stay in Italy, during which he absorbed so much of the classic spirit. Physically Goethe recalled the Greek Ideal of manly beauty—a powerful and symmetrical frame and features cast in heroic mould. On the mental side the resemblance was no less marked. He seemed instinctively attracted by the calm and majestic beauty of the classical spirit as reflected in literature and art. This feeling grew during his Italian visit and profoundly influenced his later works.

thought. He wanted the fullness of life himself, and tried to show others how to live fully.

Goethe's long life was, indeed, a full life. He was born at Frankfort on Main, August 28, 1749, and his boyhood was spent in that city. He was taught at home by his father. From Frankfort he went to the University of Leipzig, and from there to the University of Strasbourg. At Strasbourg he met the critic Herder, who directed his attention to Shakespeare and to folk poetry (the ballads and songs that seem to have no author, and live only in the recitation and singing of the common people). Such literature offered more naturalness and warmth and real life than were to be found in 18th century poetry. The songs Goethe now wrote were indeed marked by greater naturalness and truth to life, and made the beginning of a new and great era in German literature. His first drama of note, "Gotz von Berlichingen," is the story of a lawless baron of the 16th century, and shows the influence of Shakespeare.

Goethe won the friendship of the Duke of Saxe-Weimar, a ruling prince of Germany, who made him a Councillor of State at Weimar. Goethe took his official duties seriously. He gave particular attention to developing the agriculture, forestry, and mining of the duchy, and thus started his studies in the natural sciences, in the course of which he foreshadowed the Darwinian theory of evolution. Later he was, for 22 years, the director of the duke's

court theatre. Other famous men, notably Herder, Wieland, and Schiller, were also attracted to Weimar, which became the intellectual centre of Germany.

In 1786-1788 Goethe travelled in Italy, drawn there by his interest in Greek and Roman art. He himself regarded this first visit to Italy as the turning point in his life. He saw that the 'natural' expression in poetry had gone too far, and his experience in Italy gave him a broader and sounder view of literature.

Goethe's friendship with Schiller, the best loved of German poets, is one of the famous literary friendships of history. It was helpful to both. It gave Goethe new inspiration, and a surer guidance to Schiller's rather too impetuous genius. The death of Schiller in 1805 was deeply mourned by Goethe. The friendship is commemorated in Weimar by a statue of the two poets with hands clasped. Goethe died at Weimar, March 22, 1832.

Goethe's chief works, in addition to his prose writings and songs, odes, etc. were "Gotz von Berlichingen" (1773), "Werthers Leiden" (Sorrow of Werther) (1774), "Iphigenie auf Tauris" (1787), "Egmont" (1788), "Torquato Spano" (1790), "Reinhold Fuchs" (Reynard the Fox) (1793), "Wilhelm Meisters Lehrjahre" (Wilhelm Meister's Apprenticeship) (1796), "Hermann und Dorothea" (1797), "Aus meinem Leben: Dichtung und Wahrheit" (autobiography) "Faust," complete (1832).

## The WORLD'S Most Precious METAL

*From the earliest days gold has been accounted the most precious substance and used as the basis of commerce. Here we are told how and where it is produced, and some of its manifold uses.*

**Gold.** Although gold is widely distributed over the earth, it occurs mostly in such small quantities that it can by no means always be profitably extracted.



Prospecting for Gold  
Canadian Nat. Rlys.

It is even found in sea water. Gold is an elementary mineral, or element, its atomic number is 79 and its atomic weight 197.2. It is a heavy metal, having a specific gravity of 19.32, its melting point is 1,061°C. When pure, its colour is a bright yellow with a faint reddish tinge, making it the most attractive

ornamental metal of all. Despite the fact that gold has been mined from remote antiquity, the amounts recovered have been so small, and have

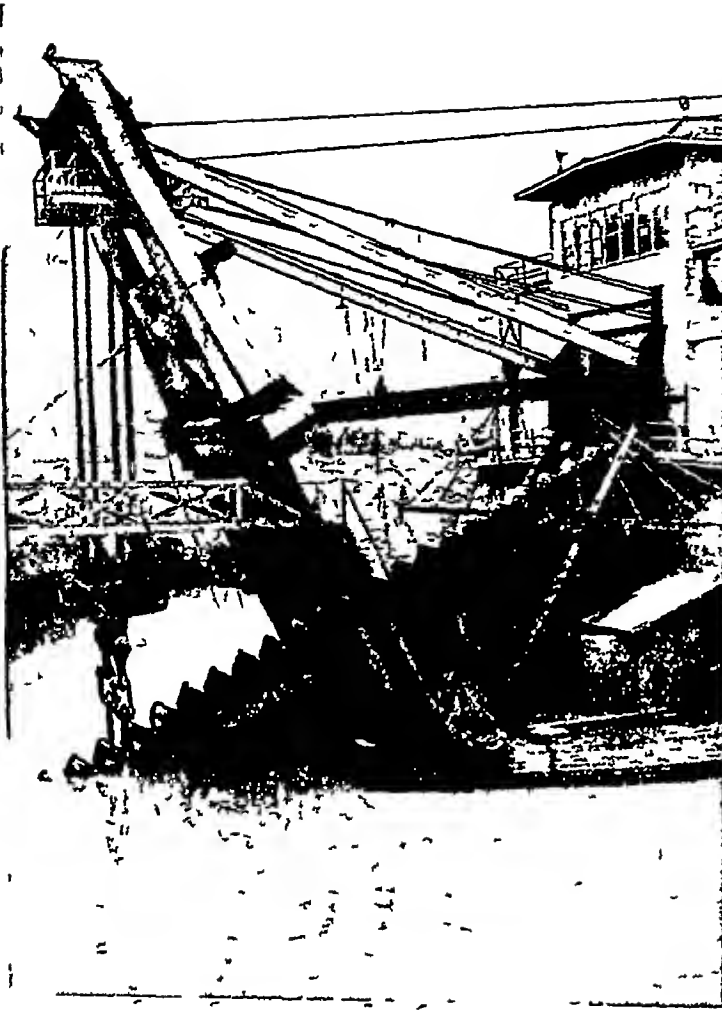
required such expenditure of time and labour, that it remained the most precious of metals until the discovery of a few even rarer metals in recent times.

Most of the gold mined in the earlier days was produced in the Spanish Peninsula, Greece, Asia Minor, India, and the Ural Mountains of Russia. After the discovery of the New World great supplies were obtained from Central and South America, but the total production from that time to the discovery of the California gold-fields was less than the average annual production today.

An enormous jump in gold production resulted from the discovery of the California deposits (1848) and other great fields, the most important of which are, with dates of discovery: Australia (1851), British Columbia (1858), New Zealand (1858), British India (1884), Witwatersrand, South Africa (1896), Alaska (1897).

The greatest gold-producing region today is the Witwatersrand district of South Africa.

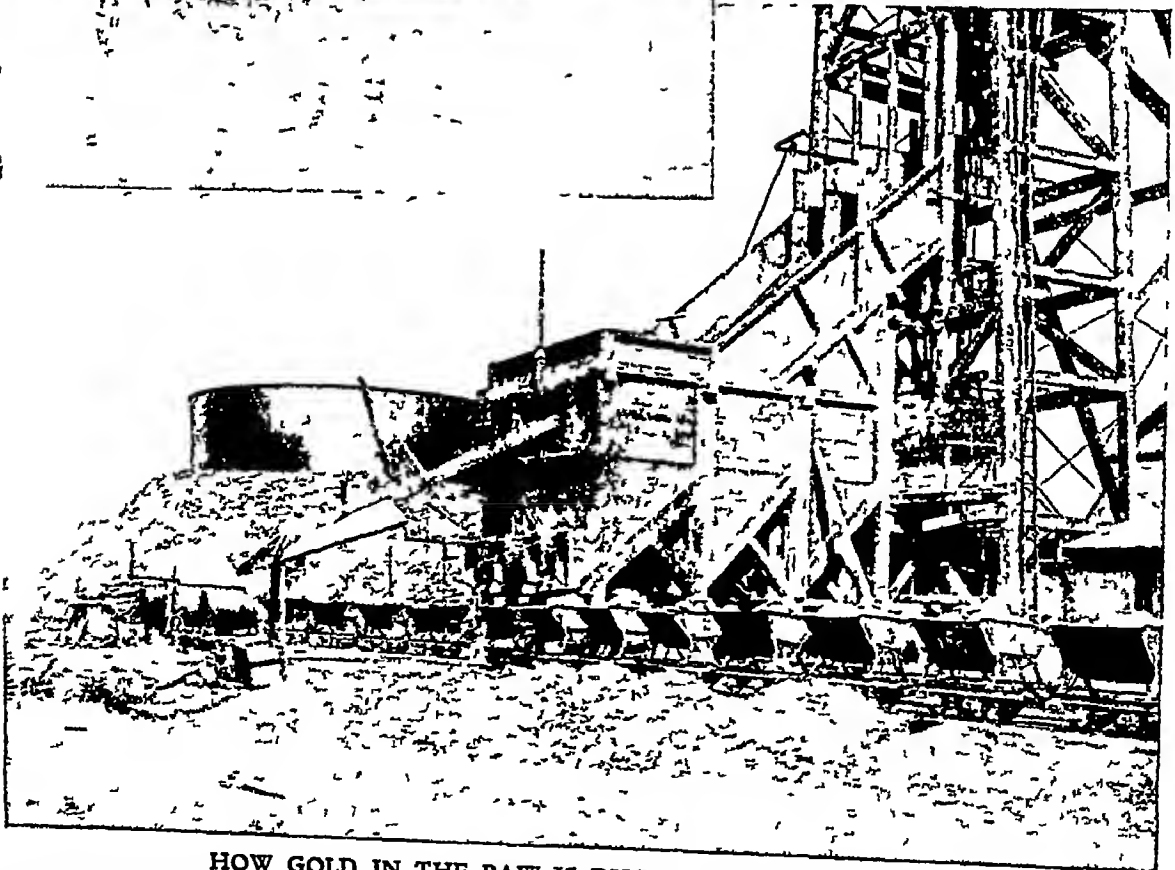
## GOLD



Johannesburg is the largest gold mining centre, with an output which in some years has exceeded £30,000,000. The United States, including Alaska, ranks next to South Africa in production. Until the World War Russia produced twice as much gold as all South America. Today Russia is again a big producer, and it is even hinted that when present plans for re-organization are in full operation, the Soviet will become second only to South Africa in gold production. The Mysore mines in India are other big producers.

Gold is found both native and in combination with various other elements. Native gold occurs in rocks, in many cases in quartz veins, and in some iron pyrites. It is also found in some sands and in beds of gravel deposited by rivers, when it is known as "alluvial" gold.

There are two principal methods employed in mining gold (1), "placer" mining for alluvial deposits,

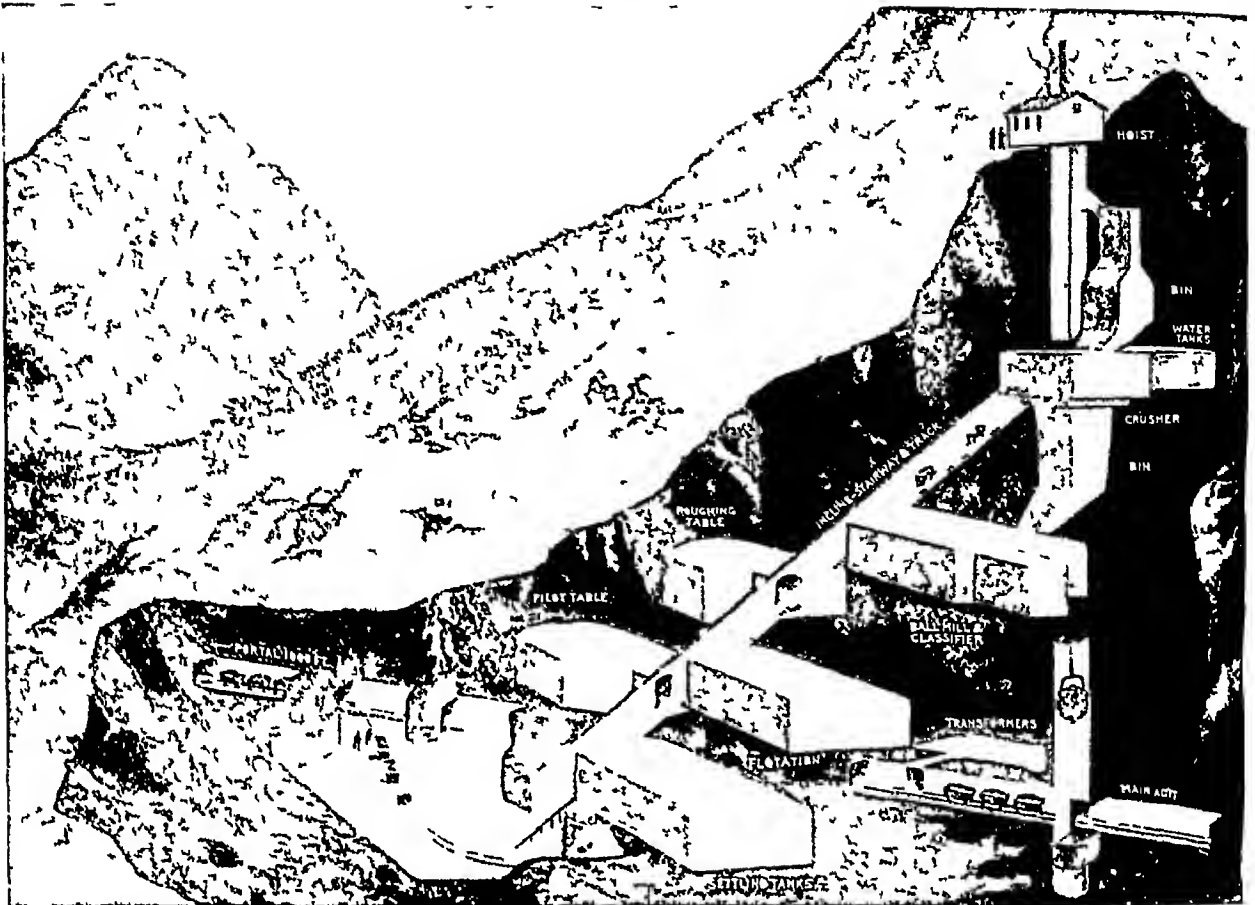


### HOW GOLD IN THE RAW IS DUG OUT OF THE EARTH

These machines represent two of the principal methods used in obtaining gold—dredging and mining. In the upper picture is the chain of buckets with which the big dredger scoops gold-bearing gravel from the bed of the California river where it operates. Within the dredger is machinery which extracts the gold. Below is the entrance to a gold mine in the Transvaal, South Africa, showing trucks loaded with ore.



## GOLD



**A GOLD MILL FORCED UNDERGROUND BY SNOW**

A mining company in the mountains of Ouray County, Colorado, U S A., devised this scheme to escape the snow slides which were constantly destroying their property. The plan shows all the parts of the mill tunnelled out and excavated beneath the surface of the hill. All that is visible above ground is the small hoist-shed.

and (2) "lode" or "quartz" mining, where the gold is in solid rock. Placer mining was known in ancient times. Gold washing as early as 4000 B C., is shown in Egyptian rock carvings.

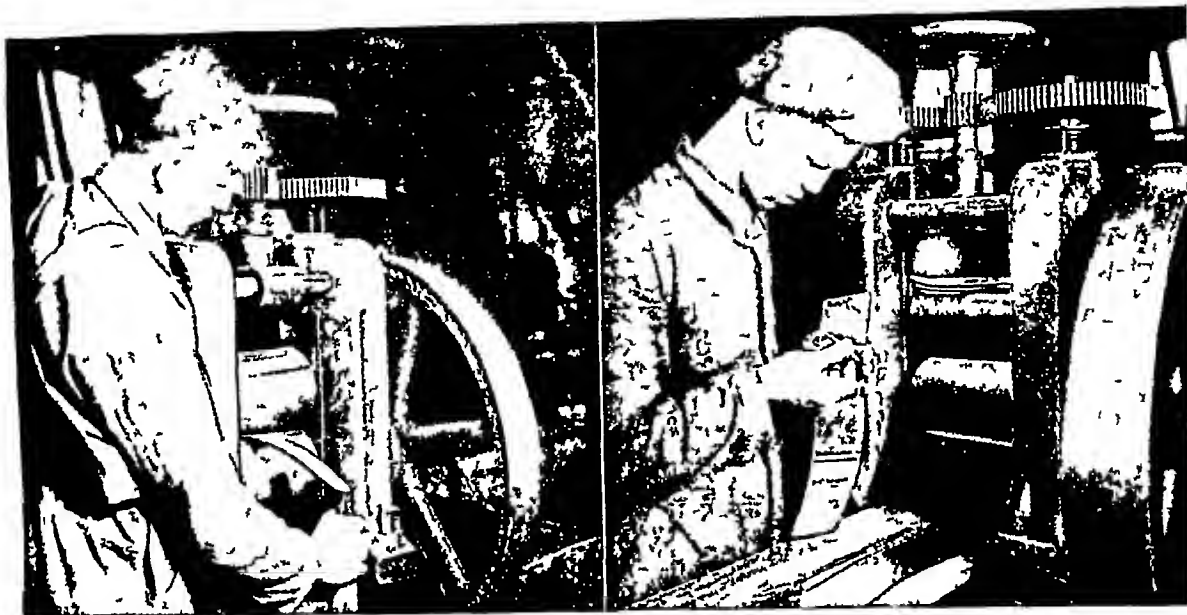
In placer mining, Nature has already done the greater part of the work. In the process of wearing hill-sides down by erosion, gold, being one of the heaviest of minerals (19.27 times as heavy as water), naturally goes to the bottom of streams. There it is deposited in the form of scales or nuggets, for the most part in the same shape in which it was originally held in the rock. The size of the particles varies from fine powder (gold dust) to the great Australian "Welcome Stranger" nugget, weighing 2,520 ounces—the weight of a medium-sized man.

The separation of gold from the gravel and sand is accomplished on the same principle that has been in operation through the agencies of Nature. Masses of the gold-bearing gravel are stirred up with water, and the heavy gold sinks to the bottom. This is done on a small scale in a prospector's pan, and on a large scale in sluices. In hydraulic mining, great beds of gravel are washed out by streams of water conducted through pipes like a fire hose. These jets are so powerful that men and animals have

been killed by them at a distance of 200 feet from the nozzle. Gold dredging is also carried on by means of flat-bottomed boats with devices to dig gravel from the bed of the stream, or from the bottom of the sea when the water is shallow.

Mercury, which readily unites with gold, is put into the gold-bearing gravel, thus catching fine particles of gold which might otherwise escape. The resulting amalgam is separated by heat—that is, the mercury is vaporized and the gold is left free, to be melted into bullion.

Placer mining is becoming less important, because gold obtainable in this way is growing scarcer and less worth extracting, and most of the world's gold today is obtained by lode mining. The gold-bearing ores are taken out of the rocks, crushed in stamping-mills, and passed over copper plates covered with mercury, to catch as much of the free gold as possible. The ores still contain a large proportion of gold, however, so further treatment is necessary. This usually takes the form of the cyanide process, in which a solution of cyanide of potassium is poured over the concentrated ore, dissolving the gold. From this solution the gold is precipitated on zinc shavings, or by electrolysis. (See the article on Electrolysis)

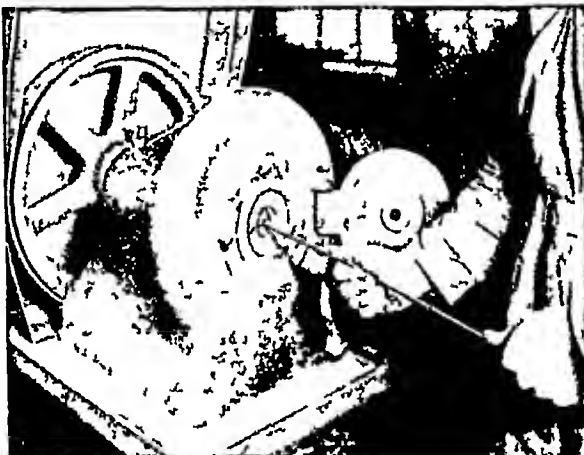


### HOW GOLD IS PREPARED FOR USE IN INDUSTRY

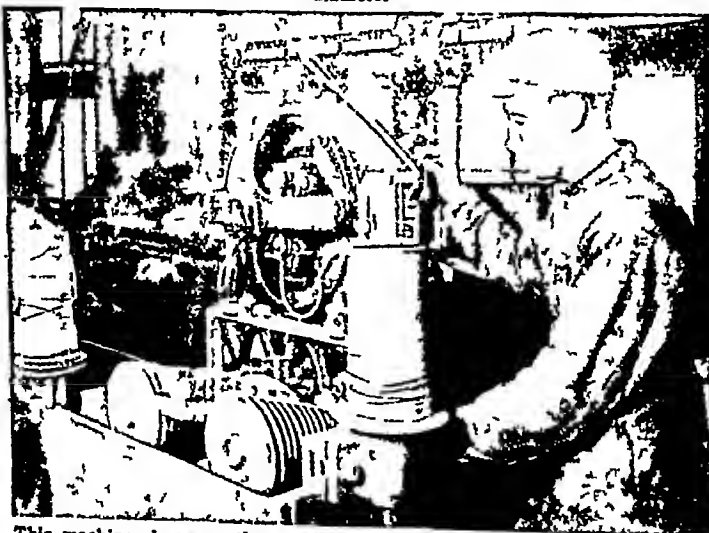
These two pictures show how gold is reduced to thin strips for the use of jewellers and others. A bar of gold is passed through the rollers and flattened. A turn of the hand wheel on top reduces the space between the rollers and the bar is passed through again. The process continues until the desired thinness is obtained.

Another process, less used, consists in roasting the ore to convert all the metals except the gold into oxides, then treating the roasted ore with chlorine gas, which unites with the gold to form gold chloride. The gold chloride is dissolved in water, and the gold is precipitated by various reagents. In the great Rand mines, little more than 55 to 65 per cent of the gold was extracted before the introduction of the cyanide treatment in 1890. Now about 94 per cent is saved.

When first extracted from its ores, gold nearly always contains some silver, copper, or other metal, which must be separated. This separation, or refining, is done at refineries or at the mint, by electrolysis or by treatment with chemicals. Since pure gold is too soft for



Here we see the making of gold wire. As the wire passes into the machine, many little hammers beat upon it and reduce its diameter.



This machine shows another method of wire making. The wheels draw the wire through a succession of dies, each of which makes it thinner.

ordinary use, it is nearly always alloyed with copper or silver, or both. (The gold coins of Great Britain, no longer in circulation, were alloyed with copper.) These metals change the colour, copper making the alloy redder than pure gold, and silver whiter. The proportion of gold contained in an alloy is expressed in two ways: in *carats*, that is, the proportion on a scale of 24, or in *fineness*, on a scale of 1,000. Pure gold is 1,000 parts, or 24 carats fine. Gold with 18 parts pure gold and 6 parts alloy is 18 carat gold, or 750 parts fine.

In malleability, gold stands first among the metals, being capable of being beaten to a thickness of  $1/250,000$  of an inch as a sheet. Wires made of silver and gold have been drawn to such fineness

## GOLD STANDARD

limited distribution, whose attractiveness and qualities created for it a wide demand. This made gold valuable or, as we should say, very expensive, and therefore a suitable standard unit for currency purposes, for on its world value could be based the prices of all commodities, including the metals of the baser currencies. Another factor in favour of gold was its acid-resisting properties, it could not easily be counterfeited. Its bright lustre and polish when coined, and its imperviousness to oxidation were other influences which made gold the ideal unit of currency.

Until the World War gold coins were current in all European countries, in the British colonies,



**FRENCH GOLD FOR LONDON**

When France 'went off the gold standard' in 1936, she thriftily invested quantities of gold in England. Here some bars are being unloaded and carefully counted in London.

the United States, and, in fact, nearly all over the world. China, India, and Mexico were the only great countries to continue using silver as standard currency. The world was then said to be on a "gold standard"—that is to say, the monetary units of each country (the pound sterling, the dollar, the gulder, the mark, the franc, etc.) bore a fixed relation to the standard price of gold, and therefore each nation's monetary units had a fixed relationship to all other monetary units. It is easy to see how this world system, based on the price of gold, facilitated and encouraged the flow of international trade.

During and after the World War (1914-1918) factors operated which greatly altered the relations between a standard gold price and

the value of monetary units. Combatant nations had to purchase immense stocks of raw materials, munitions, and foodstuffs from non-combatants, and they had to pay in gold coins or bars. Similarly, war debts and reparations were decreed to be paid in gold only. The result was huge shipments of gold, principally from Europe to the U.S.A., and the consequent heavy depletion of the gold stocks of Britain, France, Germany, and Italy. These and other countries had withdrawn gold coins from circulation, but they found it increasingly difficult to remain on the gold standard because of this incessant drain on their gold reserves.

Under the gold standard, the Bank of England was compelled to buy any gold offered to it at £3 17s 9d per standard ounce (22 carats) and to sell it (in amounts of not less than 400 ozs) at £3 17s 10½d per ounce. At this price the pound sterling was worth exactly one gold sovereign, and up to 1925 the Bank of England would pay out sovereigns for notes at this rate. But the Bank of England had not an illimitable supply of gold, and the Government prevented gold being bought for normal purposes from the Bank. Other countries took, or had taken, similar measures, so that supply fell greatly below demand. The inevitable result was a steep rise in the price of gold, and a fall in value of the monetary units.

### After Britain 'Went off Gold'

As an example of this double operation of rise and fall, let us look at the value of the pound sterling before and after. When the Bank of England was obliged to sell 123 grains of standard gold for a pound sterling, the relation between gold and the pound was fixed absolutely. But when the price of gold rose, the Bank could only sell, say, 100 grains of gold for a pound, so that the value of the pound fell proportionately as the price of gold increased, or, to put it another way, the pound sterling, instead of being able to buy twenty shillings' worth of gold, could now purchase only sixteen shillings' worth.

By 1931 the demand for gold had become so great, and the Bank of England's gold reserves so low, that the Government forbade the Bank to sell gold for export. This is what is known as "going off the gold standard." Its effect is that the monetary unit falls below the value it previously bore in relation to other units on the gold standard. Thus when Britain went off the gold standard in September, 1931, the external value of the pound sterling, in relation to the American dollar, the French franc and the Dutch gulder, all of which remained linked to gold, fell considerably.

Many countries followed Britain's example in going off the gold standard, and allied themselves with her in the "Sterling Group."

# The ROYAL and ANCIENT GAME of GOLF

*A knowledge of the game of golf is almost a social necessity, for even if one does not play it, constant reference is made to "bunker," "bogey," "birdie" and other technical terms, in conversation and in print*

**Golf.** Golf is one of the few games in which both old and young may excel, for champions in this difficult but fascinating game have been as young as 18 and as old as 60



More than any other game, perhaps, golf calls for the spirit of courtesy and fairness. A player stands quietly aside while his opponent makes his strokes. He assists in every way to give his opponent an equal chance with himself, and should a player lose a ball, the other searches for it as diligently as if it were his

own. The golfer must wait until the player or players immediately ahead are out of range, or alternatively warn them with the cry of "fore." Golf also puts a player on his honour, for he alone keeps track of his own score. These "self disciplines," combined with the skill required to excel and the excellent physical exercise obtained, usually in attractive scenery and surroundings, fully entitle golf to its high place in the list of games.

A full size golf "links" consists of 18 "holes" of varying lengths, from about 100 yards to 500 yards and more, the distance being measured from the starting point, or "tee." This is a level plot of ground about 12 feet square, from which the players "drive off" into the "fairway," which is the name given to the broad avenue of turf leading to the hole itself. For 200 yards, perhaps, this fairway is smooth and undulating, with no obstructions, though woods and tall grass may flank it on both sides. Then a "hazard"—an obstruction either natural or artificial, such as a brook or a ditch or a mound of earth fronted by a sand pit called a "bunker"—may cut across the fairway and form a trap for the unwary player. If the golfer hits his ball into one of these traps, he generally has considerable difficulty in striking it out. But if he plays skilfully he remains outside the traps, and is able to approach the "green," which lies at the end of the hole, without wasting any strokes and adding to his score.

The "green" is a plot of ground of no regulation size or shape, but usually about 30 or more feet in length, breadth, or diameter. Here

the grass is cut close, and in the centre is a hole  $4\frac{1}{2}$  inches in diameter, lined with metal and marked by a flag on a "pin" about three feet high. When the golfer is some distance from the putting green, this flag indicates the correct direction for his stroke. As soon as the player succeeds in "sinking" his ball in the hole, and his opponent has done the same, they both move on to the next tee to play for the second green. They continue to play in the same manner until they have made the full round of 18 holes. Some golf courses consist of only 9 holes, and in that case the usual practice is to make two rounds.

The object of the game is to send the ball into each of the holes successively in the fewest possible number of strokes. In "match" play, each hole is counted separately. The winner is the one who has the most holes to his credit when the course has been completed. In "medal" play, the golfer who completes a certain number of rounds in the lowest total number of strokes is the winner, whether or not he wins the most holes.

The golfer may play alone, or he may play with one, two, or three others. In a "four-some" it is common practice to choose partners and to compete in match play, each partner striking the ball alternately. Whenever a player and his opponent complete a hole in the same number of strokes, the hole is "halved" and counts to neither. A player is said to be "dormy two" if he is two holes up and only two remain to be played. Should the next hole be halved, he has won the match by "2 and 1"—that is, two up and one to play.

The term "bogey" indicates the standard number of strokes which should be taken by a scratch player at any given hole. One under bogey is called a "birdie", two under bogey, an "eagle". If, on the putting green, one ball comes to lie directly between another and the hole, and more than six inches away from the other ball, the position is called a "stymie".

A golfer normally plays off a handicap allotted to him by his club. Should a player (in a medal competition) take 88 strokes for the 18 holes, and his handicap is 8, his score would read  $88-8=80$ . But should his handicap be "plus" 2, the score would read  $88+2=90$ .

The ball, about  $1\frac{1}{2}$  inches in diameter, is made of many strands of rubber wound round a core which is now also of rubber, but which in the early days of organized golf was of gutta percha.

(such a ball was known as a "gutty") The white (or, for use in snow, red) casing is variously marked to lessen wind resistance and to give greater carrying power

Most players use at least six different clubs, each adapted for a particular kind of stroke. The clubs have a slender shaft about 3 feet long, now mostly made of steel tubing, and a strong wooden or iron head with which to hit the ball. When driving off, the player may "tee" the ball upon a little elevation of sand called a "tee" or a wooden peg. This device gives him a chance to get the most effective stroke. In driving off, the golfer usually uses a wooden-headed club called a "driver." Two hundred yards is a good drive, but many players are capable of driving over 250 yards.

The other clubs—such as the "brassie," the "cleek," the "mid-iron," the "mashie," and the "niblick"—are variously designed for propelling the ball low and far, or raising it in the air and letting it fall "dead," or clearing obstacles, or "lifting" it out of holes or tall grass. On the green the player uses a short straight-faced club called a "putter." The players' clubs are usually kept in a bag which is carried by a man or boy called a "caddie." Many of these boys have developed into champions.

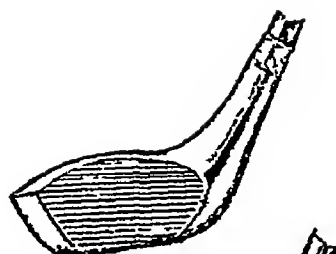
The history of golf runs far back into the early centuries. The Romans, soon after the beginning of the Christian era, played a game with a mallet and a leather-covered ball stuffed with feathers, called *paganica*. The French in early times had a game akin to golf called *jeu de mail*, and the Dutch played a stick-and-ball game on the ice called *het lohen*. In all of these games the object of the player was to send the ball so that it would strike a mark. While the Dutch and the French were still hitting at marks, the Scots

refined the game by making holes in the ground to receive the ball. In 1457 the Scots were playing the game so enthusiastically that Parliament, fearing either that it might have a questionable moral effect on the people, or that it might supersede archery, forbade the game, and in fact did not cease to interfere with the sport until 1491.

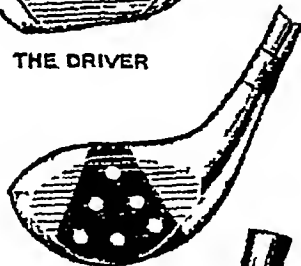
The most famous golf course in the world is St Andrews, in the county of Fifeshire, Scotland, the headquarters of the "Royal and Ancient Golf Club," whose rules form the international code of golf. This club, founded in 1754, is the ruling body in Britain.

The annual "Open" golf championship is unusual in that both amateurs and professionals are allowed to compete. Almost invariably the latter fill the leading positions, a notable exception was the famous R. T. ("Bobby") Jones, the greatest of the American invaders, who won in 1926, 1927 and 1930. The Open is held on various courses, such as St Andrews, Sandwich, Hoylake, or Carnoustie, as is the Amateur championship. It should be noted that the Open is decided by four rounds of medal play, while the amateur champion has to win through a knock-out match tournament. There are now numerous other championships, such as the English Amateur, the Ladies' Open, girls' and boys' championships, and so on. The professionals and amateurs of Great Britain and the United States meet in contests known respectively as the Ryder Cup and Walker Cup. Both these are held in alternate years.

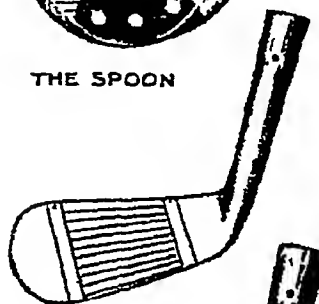
**Goose.** This is a bird of wide popularity. Through "Mother Goose" it belongs to the nursery, the fable of the "goose that laid the golden egg" takes it into the school room, where later it figures as the heroic and noisy bird that



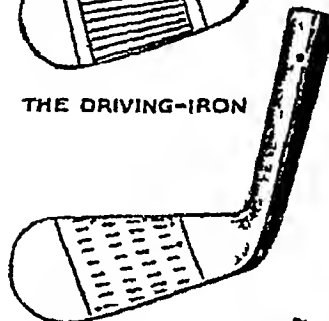
THE DRIVER



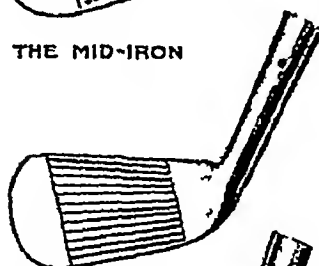
THE SPOON



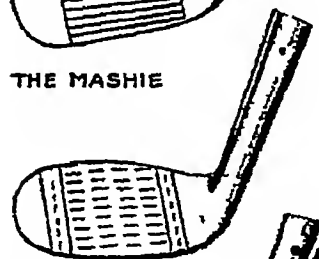
THE DRIVING-IRON



THE MID-IRON



THE MASHIE



THE NIBLICK



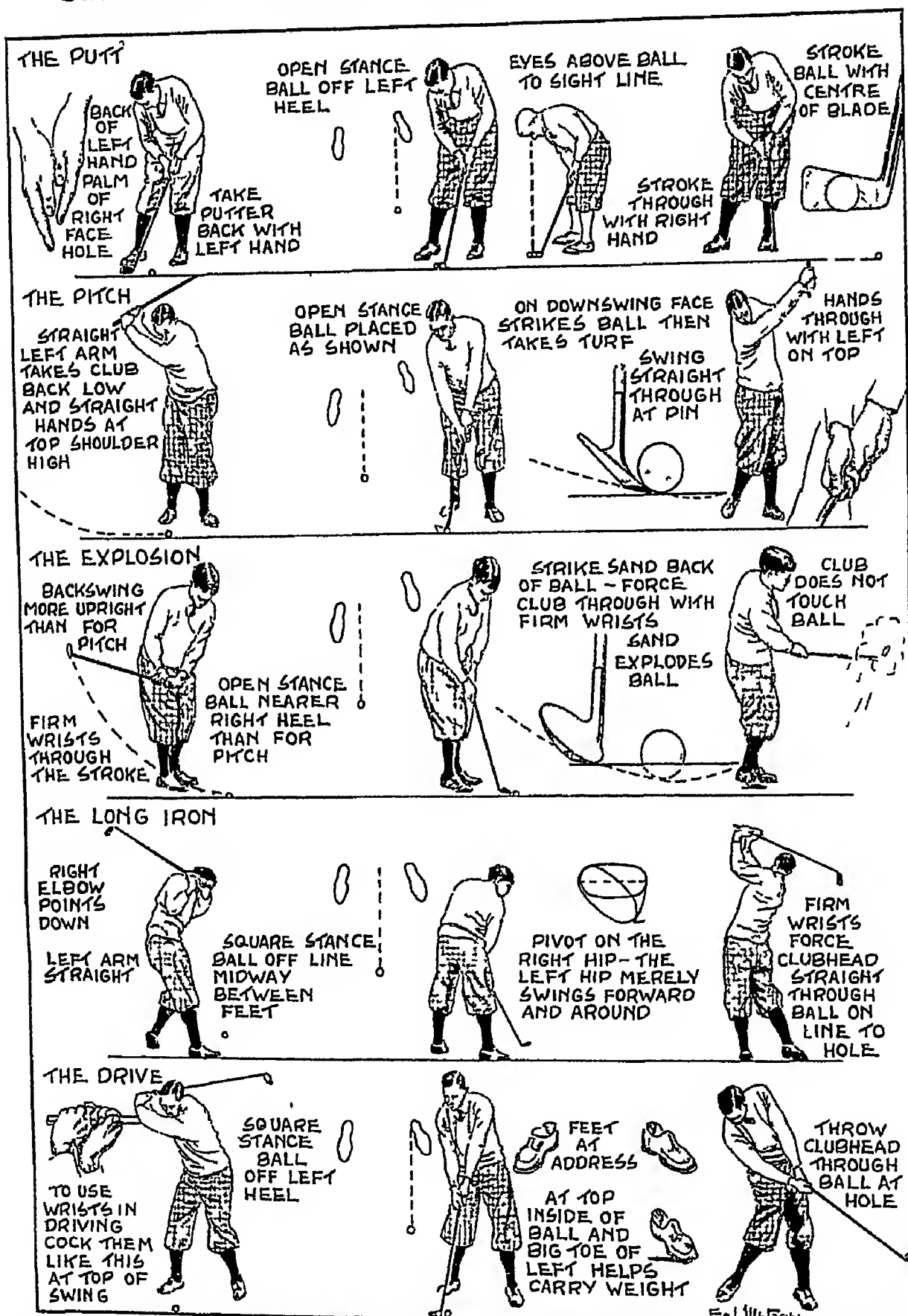
THE PUTTER

#### CHIEF GOLF CLUBS

These are the seven clubs most useful to the golf player. The top two are of wood, and the remainder of iron.



# STROKES A GOOD GOLFER NEEDS TO KNOW



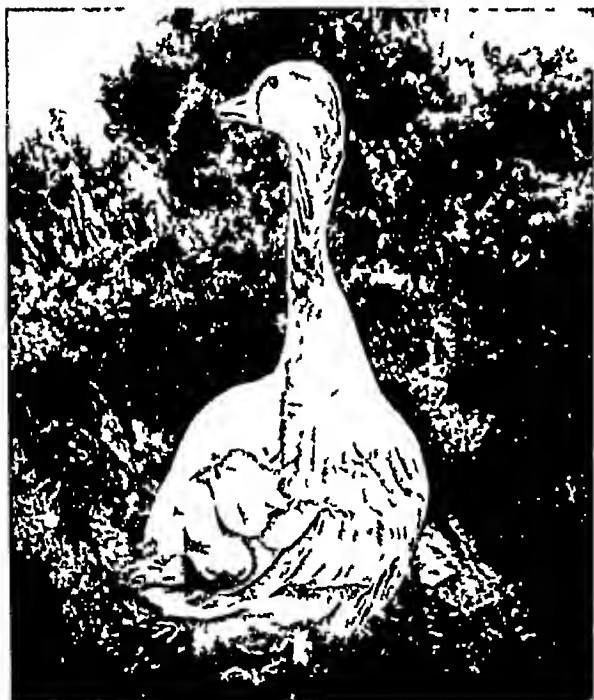
These pictures show the correct "stance" (position of the body) and the right way to execute some of the varied strokes that make golf so fascinating a game. Every detail of these shots must be practised with the utmost care, and any player who hopes to excel must be careful to get them right when starting to learn the game. Bad golfing habits are quickly formed at the outset, and once a player acquires them, he overcomes them only with the greatest difficulty.

## GOOSE

saved the city of Rome, and as furnishing Tiny Tim's Christmas dinner in Dickens's famous "Christmas Carol." Sportsmen prize the wild goose, while the domestic goose is of great importance to housewives, not only for its flesh and eggs, but for its feathers, which stuff pillows and feather-beds. Goose fat is often used in place of lard for cooking, and from the livers is made the *pâté de foie gras* for which Strasbourg is famous.

There are about thirty species of geese, all belonging to the same family as the ducks and swans. The male, called the "gander," resembles the female in plumage. All the geese breed in cool and temperate regions, some even in the Arctic Circle, and migrate south for the winter.

Of the half dozen British species, the "grey-lag" (*Anser anser*) breeds in the far north of Britain. It ranges over nearly the whole of



Europe and northern Asia, and is the original of most domestic geese. Other species, which visit us chiefly in autumn or winter, are the Brent goose (*Branta bernicla*) which has a black head and neck, and the barnacle goose (*B. leucopsis*), so called because of the legend connecting it with barnacles (*q. i.*). Both are more marine than the other species.

The "Canada goose" (*B. canadensis*) is the most familiar of American wild

geese. It is a grain-feeding bird, and its flesh is most palatable.

Geese have been domesticated from a very remote period, for they are shown on the monuments of ancient Egypt. The long wing-feathers of the goose were used to feather Man's arrows in the Middle Ages, and supplied him with quill pens until steel pens took their place.

### Gooseberry.

It may come as something of a surprise to you to hear that the gooseberry

is actually a fruit of which we may be really proud! Yet this is so, for in every part of the world the cultivation of this fruit has been neglected, with the exception of England. Here cultivation began in the 16th century, with the result that English markets have gooseberries as large as plums and sweet enough to eat just as they are picked from the bush, while those of other countries, like our own wild ones, are small, hard, and proverbially sour—from which, maybe,

## GOOSEBERRY



### GOOSEBERRIES

This variety is known as the Criterion. There are many such "breeds," big and small, of different colours produced mainly by Lancashire "fanciers."

*Photo Chas Jones*



### THE WILD GOOSE TRAVELS FAR

Once the "grey-lag" goose (in the upper picture) used to breed regularly in Norfolk, but now it is chiefly a winter visitor to England. A "skein" of wild geese (the term used of the birds when flying) is seen in the lower illustration. Their flight is straight, fast, and high, they sometimes cross the Himalayas at an altitude of over six miles.

*Top O. G. Pike lower B. N. A.*

comes the phrase "playing gooseberry," applied to a chaperon who plays propriety to a pair of lovers

Our own gooseberries are yellow, green, or deep purplish when ripe, and, besides being good to eat raw, make lovely jam, pies, and other sweets. The bushes are prickly, and the flowers small and bell shaped, showing their relationship to the currants. Gooseberries are so called perhaps because geese are said to like eating them. Their scientific name is *Ribes grossularia*.

**Gordon**, GENERAL CHARLES GEORGE (1833-1885) "Chinese Gordon," as he was commonly called, was the son of a British general, and was born at Woolwich, January 28, 1833. He was educated at the Royal Military Academy at Woolwich, and began his career in the British Army in 1852 with a lieutenant's commission in the Royal Engineers. He served in the Crimean War, and afterwards in Asia.

At the age of 30 we find him a commander of the "Ever Victorious Army" of China, putting down the Taiping rebels, who sought to drive out the unprogressive Manchus and to establish "the reign of eternal peace." In 1864, within 18 months of Gordon taking command, the ten year-old rebellion which had cost millions of lives was relentlessly suppressed. The grateful Chinese thereupon conferred on Gordon the Yellow Jacket and the Peacock Feather of a Mandarin.

The next nine years of his life were spent in constructing forts in England and serving on various international commissions. Then, in 1873, his services were lent to the Khedive of Egypt for the organization of the Sudan, of which he was governor general from 1877 to 1880. In 1884, four years after he resigned this commission, he was sent back to the Sudan by the British Government. His commission was to bring out of the region the Egyptian garrisons endangered by the revolt of the "Mahdi" or Prophet, a religious leader whose aim was not unlike that of the Taiping rebels in China. But, in disregard of his orders, General Gordon sought to hold the district, and was besieged in the city of Khartum. For ten months the city held out, when it finally fell (January 26, 1885), two days before a British relief expedition reached it, the whole garrison, including its commander, was massacred.

So fell a soldier of true heroic type, a Puritan mystic in the midst of 19th century materialism, a man who lived by the faith that can move mountains, doing whatsoever he did for the glory

of God, in the full conviction that he was an instrument in the hands of God, fearing nothing and doubting nothing, one who, left to himself, had repeatedly accomplished the apparently impossible, chiefly through his extraordinary power of influencing others. In China he had led his troops to battle, himself armed with nothing but a cane. Sudanese and Arabs had fallen under the spell of his personality. As an administrator dealing with uncivilized or half-civilized peoples, unhampered by the complex organization of political systems, he had been incomparable, but he was a very impracticable subordinate. When the public services had not demanded his time and energies, he had devoted them not to his own advancement but to the redemption of waifs and strays.

The death of Gordon raised a storm of indignation in England against the slowness of the government in sending aid. Gladstone, then Prime Minister, pointed out that Gordon had disobeyed his orders in not leaving the Sudan when he could, but public opinion could not



THE DEATH OF GORDON

In recent years it has been the fashion, begun by Lytton Strachey in his *Eminent Victorians*, to belittle the work of General Gordon. But there is no doubt that he met his death with the greatest bravery. In this picture (from the painting by G. W. Joy) he stands at Khartum, defenceless, awaiting the final blow from a Sudanese spear.

By permission of Frost & Reed Ltd

forget his chivalrous heroism, and regarded him as a martyr. A monument was erected to his memory in Trafalgar Square, and a cenotaph was placed in St Paul's Cathedral.

**Gorilla.** The largest and most Man-like of all the apes is the gorilla, a native of the dense forests of Central Africa. Gorillas stand and walk erect more frequently than the other apes, which led early explorers to mistake them for savage men. Their bodies are covered with a mixture of grey and brown hair, they have flat noses and very prominent ridges over the eyes, and their facial expression is hideous and brutal. They are very ferocious when disturbed, but they feed upon berries, sugar-cane, and other vegetables. They live in pairs, with their offspring, or in small troops.

Until late years very few civilized persons have seen live gorillas, as they are scarce and difficult to capture, and do not live long when taken from their native forests. An old male

gorilla, which was killed in 1919, stood 5 feet 11 inches in height, measured 58 inches round the chest, 67 inches round the stomach, and 7 feet from tip to tip of his extended arms. His weight was not stated, but gorillas weighing more than 400 lb are on record. Recently, however, gorillas have been kept in several zoos, notably London and Berlin. (See Ape)

**Goths.** First of the northern barbarians whose successive assaults brought low the might of Rome were the Visigoths, or West Goths. Where the Goths first came from is not definitely known. There were stories told by their old men of a time when their people had dwelt far to the north, on the shores and islands of what is now Sweden. Then had come long, slow wanderings through the vast forests of western Russia, until they reached the shores of the Black Sea. In a hundred years of contact with the Romans they learned many things, especially the Christian religion, which was spread

among them by the efforts of a convert of their own race, a saintly man named Ulfilas.

For a time, the Goths ruled a great kingdom north of the river Danube and the Black Sea. Then the Huns swept into Europe from Asia, in A D 374, conquering the Ostrogoths or East Goths, and forcing the Visigoths to seek refuge across the Danube within the boundaries of the Roman Empire. In the battle of Adrianople, in A D 378, the Visigoths defeated and slew the Emperor Valens. For a time they lived peaceably on Roman territory, then, on the death of the Emperor Theodosius in A D 395, they rose in rebellion under their ambitious young king, Alaric, and overran a large part of the Eastern Empire. Rome itself fell into the hands of the impetuous Goths in A D 410.

Alaric's successors led their people out of Italy, and set up a powerful kingdom in southern Gaul and Spain. In the year A D 507 the Visigoths in Gaul were defeated by the Franks and were forced beyond the Pyrenees. For 200 years their kingdom in Spain flourished. It did not come to an end until A D 711, when the Moors crossed over from Africa and destroyed it.



**MOUNTAIN GORILLA AT HOME**

This magnificent gorilla lived in the jungle of the Belgian Congo. He was the "grand patriarch" of a little band of gorillas, with various female attendants and their young. When alive, he had the weight of two men and the strength of five. But gorillas are a dying race: there are not more than 50,000 left in the world.

*American Museum of Natural History*

The Ostrogoths for a time formed part of the vast horde which followed the king of the Huns, Attila, settling in the lands south of Vienna when the Hunnish kingdom fell apart. Their national hero was Theodoric the Great, a powerful and romantic figure who became king in A.D. 473. In 489 he invaded Italy, with the permission of the emperor at Constantinople.

After several years of warfare Theodoric captured and slew Odoacer, a barbarian who had usurped the Roman power and founded a powerful kingdom, which included all Italy together with lands north and east of the Adriatic Sea. His reign was one of the ablest

and best in this period. He failed largely because no permanent fusion was effected between the barbarians and the Christian-Roman population. All his wise plans for bringing this about proved futile because the Ostrogoths had been converted to Arianism, an heretical form of Christianity hated by the orthodox.

After Theodoric's death, in 526, the generals of the Eastern Empire reconquered Italy (See Justinian I). After their last battle (near Mount Vesuvius, in A.D. 552), the Ostrogothic nation marched out of Italy, to mingle and merge in other barbarian hordes north of the Alps, and so they disappeared from history.

## How AFFAIRS of STATE are MANAGED

*G*overnments and their doings occupy so large a space in our newspapers and our lives that it is essential for us to know something of their history and their problems. That knowledge this article gives us.

**Government.** When a policeman steps into the road and lifts his hand, immediately all the buses, motor-cars, lorries, carts, bicycles, etc., behind him stop. The drivers do not argue, they merely obey. If we tried to act as the policeman does, we should be promptly told to get out of the way.



'Mother of Parliaments'

Why this difference? In the eyes of the law the policeman and ourselves are on exactly the same footing. If a constable misbehaves himself he can be locked up like anybody else.

The reason why the policeman has authority is because he represents the Government.

Let us stop for a moment and try to understand the meaning of the word Government, for it will explain a great deal. It comes from a Latin word meaning to steer a ship, so it is very appropriate that this word should have been taken to apply to a nation, which may be likened to a ship voyaging through the world, sometimes sailing along smoothly, at other times in troubled waters, as during wars and calamities. The system by which the ship of State is steered is the Government. Today government means all the authority, rules, laws, and customs whereby each individual in the nation, and the nation as a whole, is directed, ordered, and ruled. In Great Britain we are in theory governed by the King, acting through his advisers and the Houses of Parliament, but in practice the Cabinet of chief Ministers directs the affairs of the country.

In course of time, as men became more civilized and ceased to rely on brute force, they began to organize themselves into tribes or groups. Out of these communities grew the nations and states as we have them today. Their members chose an exceptionally-gifted man of their number to be their chief, or king. He, in turn, chose other men also gifted to carry out his orders and to help him to make laws. The principle underlying this chieftainship or kingship was obedience. That is, the people, having chosen a king to govern them, were bound to obey his commands, no matter whether he was a good or a bad ruler.

Some of the nations are governed by an emperor, some by a king, and most by a parliament in addition. France, the United States, and other countries have no king. They are ruled by a president and a parliament. The president differs from a king in that he holds office only for a few years and is an elected administrator. Since the end of the World War several European countries have been governed by dictators with supreme and unlimited power, and these are known as "totalitarian states."

So you see how wonderful a thing is government, and how more wonderful still is the fact that all of us have a share in ruling the country in which we live. In most countries the people themselves, by their votes, elect men and women to represent and speak for them in Parliament, and as it is the latter that makes the laws, we are bound to obey. Therefore the nation, in one sense, governs itself. It is only through governments that nations express themselves.

Our own system took hundreds of years to reach its present perfection. In the time of the Norman kings there was no Parliament. The king was supreme, that is, he could do much as he liked, which was bad for the country,





### KING ALFRED AND HIS COUNCIL OF 'WISE MEN'

Our Parliament goes back to a very early period of our history, though it was not always as powerful or as representative as it is today. In this painting we are given an impression of the scene when King Alfred submitted his new laws to the Witan, or "wise men," who formed his council, as you can see, they numbered only a dozen or so, and represented mainly the Church and the Army. Our modern House of Lords grew out of this body.

as he often acted cruelly and did not allow the common people to have any share in the disposal of their own lives. Before the reign of William the Conqueror there was a Great Council of the Anglo-Saxons called the Witan, or Assembly of the Wise, and forming it were the bishops and superior clergy and the nobles whose duty it was to advise the monarch. But this did not mean that the king heeded them and, in fact, the misrule of the Norman kings led to the birth of Parliament.

Under them was established the feudal system, by which all land was held under what was known as military tenure. That is to say, the man holding a certain area of land did not pay rent for it, but handed over a small sum of money to the king, the balance was made up by providing so many men and arms to fight for the king when called upon. This plan made the sovereign the owner of all the land, and gave him the right to demand what service he wished from his subjects. All the Norman and Plantagenet kings ruled like this until the misgovernment of John so exasperated his subjects that the leading barons made him grant Magna Carta (*q v*), the great charter of liberties, in 1215.

In the reign of his successor, Henry III, was founded what was really our present House of

Commons, the assembly of elected men and women who make the laws by which we are governed, assisted by the House of Lords, for, as will be seen, it takes both Houses to make a Bill into an Act of Parliament.

The first Parliament was called by the famous Simon de Montfort (*q v*), Earl of Leicester, in 1265. He summoned certain men from the cities and boroughs, as well as the earls and barons and bishops who already acted as an assembly. Thus, for the first time, the ordinary people were given a voice in deciding the nation's affairs.

In the reign of Edward III Parliament took a great step forward. The barons and bishops occupied a separate chamber from the men who represented the cities. Their lower estate gave rise to the expression—the Commons. Thus there were two distinct assemblies, the House of Lords and the House of Commons.

Let us note briefly what was accomplished by these remarkable events. First, the nation was beginning to govern itself, for even in the reign of Edward I it was laid down that no tax could be levied by the king without the consent of Parliament, and the Commons then sitting with the barons or lords began to petition the king to remove the hardships, thus suggesting to him new measures or laws.

## GOVERNMENT

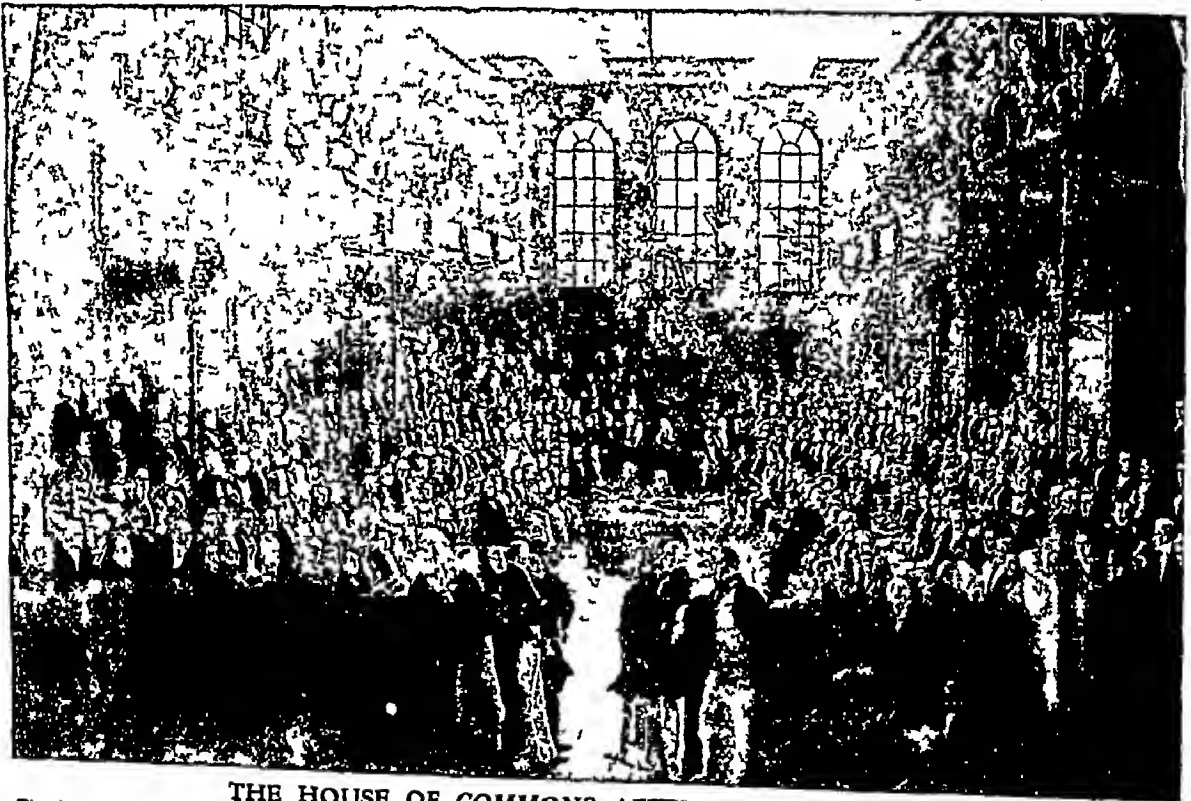
In Edward III's reign the House of Commons became still more powerful, and in return for voting money to the king, or granting supplies as it was termed, obtained from him laws which helped the people. But as yet the Commons could only get laws as a favour from the sovereign, although even in those days the people were not entirely governed by him.

At the time of Henry VII England was a limited monarchy. This means that the king, although head of the State, was limited in his power by Parliament, and could not govern exactly as he wished. His son, Henry VIII, seized great power and practically ruled by himself, as did Charles I, whose abuse of authority led to his being beheaded. But it was during the latter's reign that a number of very important rights were established. Such was the famous Petition of Rights, whereby Charles was asked to agree to levy no taxes without consent of Parliament. He did so, but later broke his promise. This was why John Hampden refused to pay the notorious tax known as ship money. The Bill of Rights of 1689, which established further reforms, was another prominent landmark.

As time went on and their numbers rapidly increased, the people called for a greater share in the government of the country. There were large districts which did not have a

member of Parliament, while for what were called pocket or rotten boroughs, with hardly any people in them, there was an M.P. This demand was met by the famous Reform Bill of 1832, which extended the vote more widely among the middle classes. Since that date the franchise, or right to vote, has been greatly extended, until in 1928 the privilege of voting was given to virtually all persons who had reached the age of 21.

In addition to Parliament there are other branches of government. Thus there is the Executive, commonly called the Civil Service, a body of officials who carry out the wishes of Parliament, and the Judiciary, or body of judges who interpret the law. We have a system of justice whereby every man and woman possesses the right to a fair trial and to obtain justice. It sometimes happens that Parliament passes a bad law, or the Executive enforces a law in a spirit quite different from what was intended by the Act, and under our system of government the citizens have a right to appeal to the courts of law. The latter are presided over by judges and magistrates appointed by the Lord Chancellor or in some cases the Home Secretary. Note again how the whole of our national life is interwoven. We elect Members of Parliament, Parliament makes our laws, and the judges, who are appointed by Ministers



**THE HOUSE OF COMMONS AFTER ITS FIRST REFORM**

The legislature (or law making body) of Britain has never been radically changed by revolution and bloodshed, but has made itself conform to changed conditions by carefully-considered degrees of compromise. The first of these in modern times was the Reform Act of 1832. This brought about a re-shuffle of constituencies by which great industrial towns were for the first time represented, but still only a small number of people possessed the vote. The first House of Commons elected under the new law is shown above, in a painting by Sir C. Hayter.

National Portrait Gallery

## GOVERNMENT

responsible to Parliament, interpret the law in the courts over which they preside

There is another branch of the judicature known as the civil law. Courts exist for cases in which no crime is involved, but where people can bring what is called a civil suit against a person or body of people. The lowest is the County Court, presided over by a paid judge. In it a man or woman can sue another for money owing up to the amount of £50. All sums above that must be sued for at the High Courts of Justice. There is the Chancery division, where cases dealing with property are heard. Then there is the King's Bench division, which consists of a number of courts, each presided over by a judge. You go to one of these courts if you claim damages from a man who has wronged you, or to obtain payment of money due to you. Above these is a Court of Appeal to which you may carry your case.

Supposing you again fail, you can take your case to the House of Lords, where the highest court of appeal sits, presided over by the Lord High Chancellor and six Lords of Appeal. If you win your case there it means that the decisions in the two lower courts were wrong. It is important to bear this in mind, for often a man or a company has done this, and by his

or its action determined a new law. There have been examples in labour questions, for instance, where, as the result of a decision of the House of Lords tribunal, fresh legislation has been introduced in Parliament.

### The British Constitution

Britain is peculiar in having no exact, written Constitution. That is why we sometimes refer to it as having an unwritten Constitution, although this is not strictly correct, because certain very important Acts which go to the making of our government are written, in the sense that they are clearly laid down in writing or printing, such as the Bill of Rights, the Habeas Corpus Act, the Act of Settlement which decided the succession to the throne of Great Britain after Queen Anne's death, Magna Carta, already referred to, and in recent times the Parliament Act of 1911, which greatly curtailed the powers of the House of Lords. The greater part of our Constitution, however, is based on custom, experience and legal decisions, not simply on Acts of Parliament. A king who rules without reference to any Constitution is called an absolute monarch, and one who observes the written, or, as in our case, the unwritten Constitution of his country, is said to be a constitutional ruler, though the latter may act in an unconstitutional way by disregarding the laws.

Another curious thing about our Constitution is that it makes no provision for a Cabinet or a Prime Minister. Yet the latter and his Cabinet or inner circle of Ministers are really the chief actors in the government of the country. The King is the recognized head of the nation, but he governs only through his advisers—that is, the Cabinet or the Government, as it is called.

### Party Government

Some mention must be made of what is known as party government in order to understand what is very typical of Britain. In the earlier days of Parliament the members were united as one party, though naturally there were differences of opinion on certain questions, but in the 17th century the idea of two distinct parties grew up. These were Whigs and Tories, which in time became Liberals and Conservatives. These were again divided up into groups, and since 1900 the Labour or Socialist party has arisen. Let us take the Liberal and Conservative parties as they were in the 19th century to illustrate our point.

We will suppose there is a general election, when there is voting for Parliament in all the constituencies or districts throughout the country. In each district a Liberal and a Conservative candidate for Parliament appears, and in his election address and speeches each asks the people to vote for him.

Let us suppose the Liberals win in 400 constituencies and the Conservatives in 200. This



### HEAD OF THE JUDICIARY

Of the three branches of the Government—the law-makers (Parliament), the law-appliers (Civil Service), and the law-interpreters (Judiciary)—the last-named occupies a very important place in national life. Its head is the Lord Chancellor, and here we see Lord Sankey, Lord Chancellor from 1929 to 1935, taking part in a procession at the opening of a Michaelmas term.



#### DECLARING A PARLIAMENTARY ELECTION RESULT

Exciting scenes often mark the declaration of the poll after an election. The results in big cities and boroughs are usually declared during the night following polling day, but in country constituencies, in which the ballot boxes have to be collected from a large area, the declaration does not take place until the following day. The photograph shows the declaration of the poll for the Epping Division of Essex, at Epping, after the General Election of 1935. The successful candidate was Mr. Winston Churchill, who therefore stands on the right of the returning officer.

means that the Liberals have a clear majority of 200 over their opponents. Next the sovereign sends for the leader of the Liberal party, and asks him to form a Government. The leader accepts the invitation and then chooses his Ministers, one to look after Foreign Affairs, another to look after Home matters, and so on. From among his chief Ministers the Liberal leader, who is now known as Prime Minister, selects a number to act with him. Together they are known as the Cabinet, and, with a few other Ministers not having seats in the Cabinet, are called the Ministry or Administration. Once the Ministry or Government of the day is formed the sovereign calls Parliament together.

The Liberals, being in the majority, are able to impose their measures on the country, that is, they can pass Acts of Parliament to suit their own views. These may be good or bad, but all the same they pass the House of Commons simply because there are more Liberals to vote for them than Conservatives to oppose them. However much the latter dislike the Liberal measures, and no matter how much the Conservative voters in the country object to them, they become law after being also passed by the House of Lords and receiving the Royal Assent.

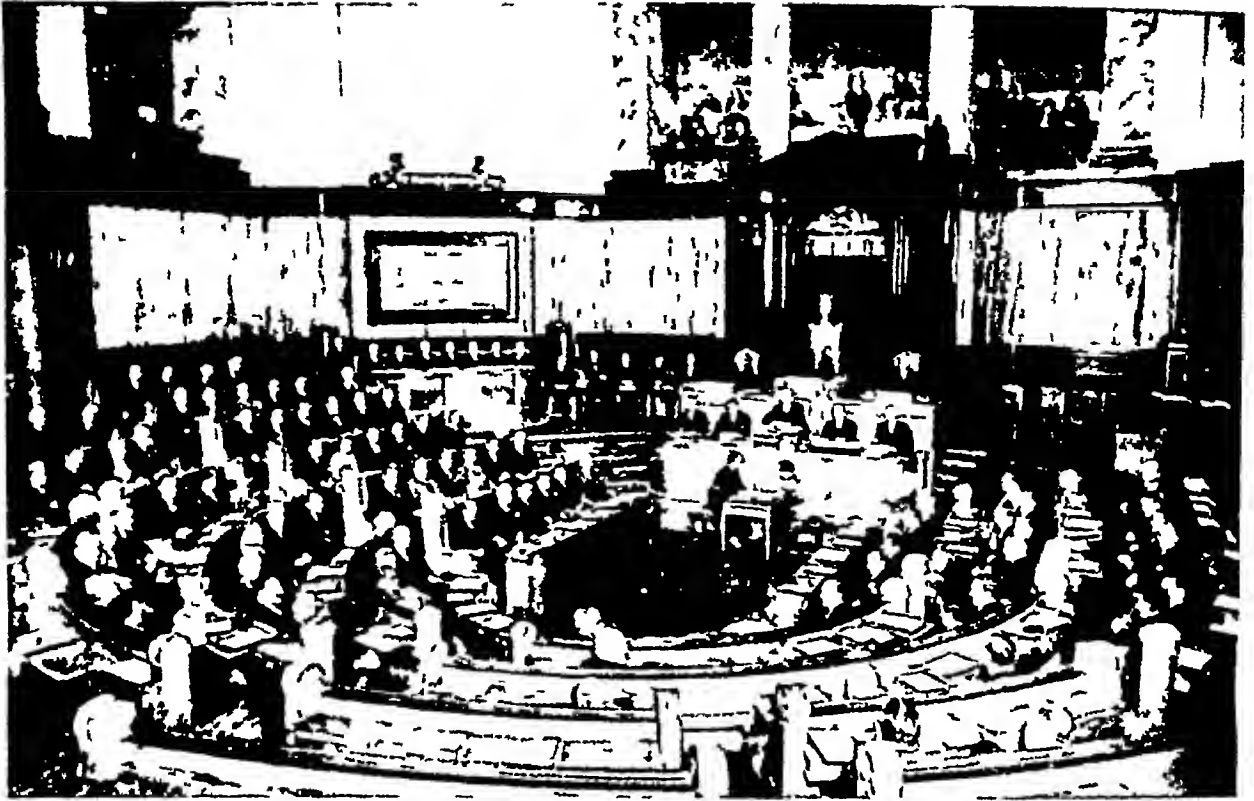
While it is true to say that party government is a distinctive and recognized feature of the British Constitution, and probably in all

the circumstances the best that can be devised, yet it has grave defects. One of these defects is that if one party is in power for, say, five years, the legal duration of a British Parliament, there is a tendency for the Cabinet to acquire too much power, and the country to be governed by the Cabinet, without consulting the people.

The people can reassert their supremacy when the Government is defeated in the House of Commons, or when Parliament's term of five years is up. A general election follows, and the voters can return the opposition party to power. Sometimes, in a serious crisis, both parties unite to form what is called a Coalition government. This happened during the World War and in the immediate post-War years. It occurred again in the financial crisis of 1931, when members of the three chief parties, Conservative, Socialist, and Liberal, united to form a National Government.

#### Local Government

Another very important part of the government of present day Britain is that known as local government. Each county has a lord-lieutenant representing the sovereign, and England and Wales are divided into sixty-two administrative counties, in each of which is a County Council elected by the votes of the people. Then, again, the counties are divided into districts, urban or rural, while London is divided into boroughs, and each has a Borough



**THE LONDON COUNTY COUNCIL IN SESSION**

The Houses of Parliament lie on the left bank of the Thames just above Westminster Bridge, and on the right bank, just below the bridge, is the stately building which houses the London County Council. This photograph shows the council chamber during a meeting of the Council. The members occupy seats arranged in a horseshoe, and on the raised dais at the further end of the chamber sits the chairman who presides over the meetings. Above his chair is the gallery for the general public.

Council also popularly elected. Great cities like Liverpool, Manchester, Leeds, Glasgow, Cardiff, etc., also have their elected council, sometimes called the Corporation. Unlike members of the House of Commons, who are now paid £600 per annum, local councillors receive no payment. Their work, however, is of very great importance to the everyday life of the community, and a seat on a local council not only affords a means of gaining experience in public administration but of rendering service to one's fellow citizens.

Local government, known as municipal government in the towns and cities, deals with local affairs such as rates, roadways, sanitation, street lighting, refuse collection, and many other matters of everyday concern. It is related to parliamentary government in that it carries out the laws affecting health, housing, etc., passed by that assembly. Local governments are also permitted to make laws, but these, being local and not so important as those of Parliament, are known as by-laws. For example, a London borough council can, without consulting the House of Commons, pass a law relating to the disposal of refuse, which all householders have to obey. In reality, we are governed by Parliament because the local authorities actually carry out its laws, modified to suit the needs of individual districts. The power so to act is conferred on the local authorities by numerous

Local Government Acts of Parliament. Many towns perform their local government under ancient charters granted by various kings, and modified and confirmed by Acts of Parliament.

#### Government of the Empire

Finally, there is imperial government. The British Empire includes the Dominions of Canada, Australia, New Zealand, the Union of South Africa, and the Irish Free State, as well as India. All these, with the exception of India, are completely self-governing countries; that is, they manage their own affairs through their elected Parliaments. But they are linked together, and to the "Old Country," by ties of kinship and association, and, above all, by their allegiance to the King. He is represented in each colony or dominion by a Governor General who acts in his place. Thus in India the Governor General is called the Viceroy, which means "in place of the king." Affairs between the Dominions and the Mother Country are transacted through the Secretary of State for the Dominions, who is also a Cabinet Minister. Indian affairs are transacted through the India Office under the Secretary of State for India, also a Cabinet Minister.

The Crown Colonies are largely controlled by the Imperial Government through the Colonial Office. Unlike the Dominions, they are only in part self-governing. They have such a



Governor appointed by the King on the recommendation of the Secretary of State for the Colonies who is a Cabinet Minister

Thus we see that the British Empire is a federation of states knit together by a bond of kinship, united in a common purpose, namely the advancement of civilization and the spread of freedom, some self governing, others still, as it were, in tutelage. The tendency is towards giving all parts of the Empire home rule or self-government—furthered by the important Statute of Westminster (1931)—as was recently done in the Irish Free State, and in India to a certain extent. But all are part of one great confederation of free peoples, acknowledging as the symbol of their unity the person of the British King-Emperor.

All the Dominions have constitutions based on that of England. They manage their own affairs, but in all cases affecting the Empire as a whole they act with Great Britain. From time to time there are Imperial conferences held in London (sprung from a conference held in the Jubilee year of 1887). The British Prime Minister, the Secretary of State for the Dominions, and the Prime Ministers of the Dominions constitute their membership. Questions such as defence and trade are discussed. This remarkable gathering is unique in the world's history. It shows that in matters affecting the Empire as a whole the British Dominions have as much say in the government of the Empire as has the Mother Country. Is it any wonder, then, that our system of government, as we have traced it from early to present times, is the admiration of the whole world? Every British boy and girl should be proud of this splendid inheritance.

#### Government and Public Offices

When you enjoy an interesting tour round a museum or an art gallery, a pleasant evening listening to the wireless, or even a letter from a friend, you should give thanks to the organizations administered as government and public offices. These are institutions that are owned and financially assisted by the State for the general education, pleasure, or welfare of the public and for the administration of the business affairs of the Government. The staff of these offices consists of members from the various ranks of the Civil Service.

An example is the British Broadcasting Corporation, the whole staff and equipment of which was taken over in 1927 by the Postmaster General, and which is now administered in the spirit of a public service. Another example is the Central Electricity Board, which controls the production of electricity and supplies current to all the authorized concerns in Great Britain. Among other organizations administered as government and public offices are many

museums—including the British Museum, the Science Museum and the London Museum—art galleries, libraries, and certain observatories, including the Royal Observatory, Greenwich. H.M. Stationery Office supplies books and stationery to Government departments, and publishes "Blue Books" and other official publications.

Offices occupied with the business affairs of the Government are such as the Colonial Office, the Crown Agents for the Colonies—who are the financial agents in this country for the governments of the Colonies—the Dominions Office, the Board of Customs and Excise, the Inland Revenue, and others.

There are many other large and important offices such as the Ministry of Agriculture and Fisheries, the Board of Trade, the Board of Education, the Ministry of Health, the Home Office, and the Post Office, which are dealt with in separate articles. (See Agriculture, Colonial Office, Trade, Board of, etc.)

**Goya y Lucientes, FRANCISCO JOSÉ DE (1746–1828)** Among the world's great painters, there are some who owe their reputation to their technical skill pure and simple, and others whose popularity depends largely on the appeal of the subjects they painted. Goya belongs to neither of these groups, for he is one of those artists who by sheer brilliance and unconventionality forced themselves upon the world of their day, and even now his pictures are almost startling in their cleverness, their originality and in some cases their bitterness, while they still look as "modern" as the latest works of living painters.

Goya was born of peasant stock at Fuendetodos, near Saragossa, on March 30, 1746. He was a dissolute and adventurous youth, and, forced to leave Saragossa after a street fight, he fled to Madrid, and presently joined a travelling bull-fighting troupe, arriving finally in Rome, where he resumed his study of art. Returning to Spain he was invited to provide the cartoons for the famous tapestries in the Prado, and by 1780 he had completed the score of cartoons which revolutionized that branch of art. Made director of the Academy of Arts in 1785, he became court painter in the following year, remaining under Charles IV and Ferdinand VII. He visited Bordeaux in 1825, but he was in failing health, and died there, April 16, 1828.

A revolutionary in life as well as in art, Goya delighted in offending conventional susceptibilities, he joined the French, for instance, when they invaded Spain, and, as a supporter of Joseph Bonaparte, was compelled to go into hiding after his expulsion. Yet, as his paintings show, his sympathies were with the suffering Spaniards. For the Prado tapestries Goya drew scenes from contemporary life in the fields and streets of Spain, works of extreme



realism, such as the Washerwoman, or Child Riding a Sheep. Later, as a court painter, he declined to allow riches or favours to obscure his cynical vision, his portraits of the king and queen and their courtiers show acute understanding of character and ability to reveal it in strong lines and brilliant colouring. Everyone of note sat to Goya, including even our own Duke of Wellington, whom he portrayed with particular brilliance, he was said to be able to paint a portrait in two hours. In addition he painted many fine frescoes.

Moreover, Goya, as versatile as he was facile, occupies a high place among etchers, his three most famous sets of etchings, *Los Caprichos*, exposing the abuses of society, the *Tauromaquia*, bull fighting scenes, and *Los Desastros de la Guerra*, inspired by the atrocities of Napoleon's invading army, express his satirical genius almost better than any of his paintings.

**Gracchus**, TIBERIUS SEMPRONIUS (163-133 B C) and GAIUS (153-121 B C) (Pron *grak'-us*) These two Roman brothers, known in history as "the Gracchi," who played a prominent part in the history of ancient Rome, were the



**THE GRACCHI AND THEIR MOTHER**

In this fine group of statuary, done by the Frenchman, Cavalier, and now in the Luxembourg museum in Paris, you see the two great Roman democrats, the brothers Tiberius and Gaius Gracchus, with their mother.

*Photo Giraudon*



**FROM GOYA'S BRUSH**

Among the great names of Spanish art that of Goya ranks high. A brilliant portraitist, he was also a master in the actual handling of his paints. If you look at the original of this magnificent portrait of Doña Isabel Cobos de Porcel, in the National Gallery, London, you can see how he does it.

*Photo Jansell*

sons of Tiberius Sempronius Gracchus, a distinguished citizen of Rome, who was twice Consul. Their mother, Cornelia, was the daughter of the elder Scipio Africanus.

Tiberius won military renown first at the siege of Carthage, and later in Spain, and it was on his journeys to and from the latter country that he first observed the deplorable condition of Roman agriculture.

As one of the tribunes for the year 133 B C, he brought forward a measure providing that the public lands should be distributed in small holdings among the poor, and that a certain proportion of free labourers should be employed on all large farms. Another tribune, who was named Octavius, opposed the proposed legislation. Tiberius, thereupon, prevailed upon the assembly of the people to deprive Octavius of his office, and the bill was passed.

Threatened with impeachment at the end of his term of office for his illegal proceedings, Tiberius set himself to obtain the tribunate for another year. The elections were held, but the Senate declared them illegal, and in the riots which ensued Tiberius and 300 of his followers were killed.



DR. W G GRACE

Dr. Grace was an outstanding figure in English cricket from 1870 until 1899, when he ceased to captain the Gloucestershire team. He was the greatest all-round cricketer in the history of the game, shining as a bowler and fieldman as well as a batsman.

Ten years after his death, his younger brother Gaius, who had carried on the work begun by Tiberius, reached the position of tribune. During a second tenure of this office he succeeded in making his brother's law operative to a considerable extent. He was, however, in constant opposition to the Senate, and in another riot the followers of Gaius were slain or scattered, and their leader, after making his escape, in his despair caused his own servant to kill him.

**Grace, William Gilbert (1848-1915)** "W. G.," as Grace was usually called, was in a class by himself as a cricketer, and his wonderful performances with both bat and ball—especially with the bat, though he was also a skilful bowler and a notable fielder—will in all probability never be equalled.

When only 15 years old he made his entrance into first-class cricket, and from then until his retirement in 1899 he scored more than 54,000 runs. Other players have scored more runs in a single innings than the "champion" (his highest score in first class cricket was 344), but "W. G.'s" total of 126 three figure innings in first-class cricket remained a record until passed by John Berry Hobbs in 1925. On ten occasions Grace exceeded the double century, and three times he reached the third century,

while he three times scored a century in each innings. In 1871 he totalled 2,739 runs, an average of 78 for each innings.

Although it is as a batsman that he is usually remembered, Grace was also a very fine bowler, as his record of upwards of 2,800 wickets testifies, and on one occasion, against Oxford University, he achieved the rare performance of taking all ten wickets in one innings.

On no fewer than seven occasions he scored over 1,000 runs and took over 100 wickets in a season, while his best bowling season was in 1875, when he succeeded in taking 192 wickets.

Born at Downend, Gloucestershire, on July 18, 1848, Grace belonged to a cricketing family, his father and his three brothers being also splendid players. Most of his career was spent with Gloucestershire, which county he captained for many years. "W. G." was trained for the medical profession, but cricket was his real career. His elder brother, Edward Mills Grace, was the first famous cricketer of the family, entering first-class cricket in 1861. The brothers, "W. G.," E. M. and George Frederick, were all in the English team against Australia in 1880.

**Grahame, Kenneth (1859-1932)** Do you know the wonderful story of the adventures of Toad, and his three friends, the Water-Rat, the Mole and the Badger? And how they fought the Wild People, the fierce and terrible Weasels and



MR. TOAD ESCAPES

Kenneth Grahame's most famous book is "The Wind in the Willows," and its animal characters have delighted thousands of readers, both young and old. Above is one of Mr. Ernest H. Shepard's delightful illustrations to the story; it shows Mr. Toad making his escape from the castle in the old washerwoman's clothes.

Courtesy of Messrs. Methuen & Co. Ltd.

Stoats who lived in the Wild Wood? And the terrific adventures Tond had with his motor-car? If you do, you won't need more reminding of them, and if you don't, you should go at once and read "The Wind in the Willows," where these and many other adventures are described.

"The Wind in the Willows" is a classic among children's books, and the man who wrote it was Kenneth Grahame. He was born in Edinburgh, and his books, though they are really meant for children, are as popular with older people as with the young. And of them "The Wind in the

Willows" has become a classic, while "The Golden Age" and "Dream Days," short stories about real children, are hardly less popular.

If you live in London you may even have seen "The Wind in the Willows" done as a play—named after its immortal hero, "Tond of Tond Hall." In all these books you will find the same delightful humour, the same wonderful knowledge of the outdoor world, and that quality which makes Kenneth Grahame, like R. L. Stevenson, readable for people of all types and all ages. Grahame died on July 6, 1932.

## The RULES of 'GOOD ENGLISH'

*Every time you open your mouth to utter a sound you are using a part of speech, even if it is only an "interjection." How we build sentences on these foundation stones is told in this chapter*

**Grammar.** More important than the knowledge of how to use a tool is the art of using your own language correctly. "Good English," as we call correct speaking, is easy to acquire if only we learn how to construct and use the simple sentence. To use it properly is very important, much more important than using a hammer, for instance. If you do not use hammers properly you may hit your thumb or bend the nail or spoil the wood, but if you do not use sentences properly—that is, if you speak or write ungrammatically—people may mistake your meaning.

If you take any book—one like this which you are reading, for instance—you can easily learn to pick out sentences. Some of the marks by which you can recognize a sentence are as follows:

First of all, it is necessary to know that a sentence is a group of words expressing a complete thought. For example, *Old King Cole* is not a sentence but *Old King Cole was a merry old soul* is a complete sentence.

Second, a printed or written sentence must always begin with a capital letter. This is very important to remember, because many children forget to begin their sentences with capitals, and so do not use this very common tool of language in the proper way.

Third, at the end of every sentence there is always a full stop or period which looks like this (.), or an interrogation mark (?), or a note of exclamation (!). It is always a safe rule to put a full stop at the end of a sentence, except when you ask a question, as *Where is my hat?* or when you utter a cry such as *The house is on fire!*

With these last two rules one can go through a book and count the sentences very easily. But you cannot be sure about these rules in some compositions written by boys and girls. For instance:

"I got my first pair of skates on my seventh birthday they were more fun than anything else I ever had. It began to thaw the day before my birthday so that I had to wait nearly a week for the river to freeze again before I could try them."

The boy who wrote this was not careful to show you where one sentence ended and the next began. The first complete statement ends with the word *birthday*, so he should have put a full stop after that word and started *they* with a capital letter.

He was perfectly right in putting a full stop after *had* and starting the next word with a capital, because the second complete statement ended with *had*, but the next complete statement runs all the way to the end of



JACK AND JILL WENT UP THE HILL

Any word that connects one part of a sentence to another is a conjunction. Here "and" joins Jack with Jill.

the paragraph, and so the writer was wrong in putting a full stop after the second *birthday*

Sometimes sentences have what seem like two or more sentences in each, but they are not exactly sentences, they are called *clauses*. For instance, I may say *I have a pain I ate too much ice cream*. But it would perhaps be more nearly true to say *I have a pain because I ate too much ice cream*. Here the two clauses are joined by the word *because*, and together they form a completed sentence.

These words that join sentences are called "conjunctions." It is interesting to notice that they also join words and what are known as phrases. In the sentence, *Jack and Jill went up the hill*, the word *and* is a conjunction joining two other words. And in the sentence, *It is in the kitchen or under the table*, the conjunction *or* joins the two phrases, *in the kitchen* and *under the table*.

The most common conjunction is *and*. This word some people use too frequently, joining all their ideas together. For instance

"I woke early and dressed and found the bait and went fishing and caught eight trout and I came home and gave them to mother and she asked me to clean them and she fried them for us and they certainly tasted fine."

This looks like one sentence, but it is not really one, for it would sound much better to break up this long statement and say

"I woke early, and after I had dressed I found the bait and went fishing. I caught eight trout. After a while I came home and gave them to mother, who asked me to clean them. Then she fried them for us. They certainly tasted fine."

If you have ever been in a museum you may have seen some of the earliest forms of the common tools which we use today. For instance, the oldest plough is a pointed stick with which the ground was dug up. Many improvements were made, until we now have great ploughs drawn by petrol driven tractors.

The same is true of the sentence. Long years ago the sentences we now use were single words. In fact, the first sentences of little children are still single words. A baby gets hungry and cries

"Milk," or touches something and says "Hot." What you would say might be "I want some milk," or "This milk is hot." This is because you use the most improved form of sentences. However, just as it took a long time for people to learn to make our improved ploughs, so it took many thousands of years for people to work out the improved form of the sentence.

And, oddly enough, we all still use a form of sentence which consists of one word. For instance, we say *Oh!* or *Fire!* These are called

"interjections." It is quite clear that such words are not very definite, because *Oh!* may mean *I hurt my toe* or *I hit my finger* or *Tom pinched me*.

But they are very handy tools to use when we are in a hurry and are excited about some thing. If you call *Fire!* people will come, even though they may not know exactly what is on fire or where the fire is.

Although people first used a single word for a sentence, and little children still do so, as soon as they wanted to be more definite they split the sentence into parts. Instead of saying "Hurt!" the little child says "Finger

hurts." He has then discovered the two parts to our sentence—"subject" and "predicate." The subject is the thing we talk about, and the predicate indicates what is said about it.

Now, all sentences can be divided into these two parts. No matter how long or complicated a sentence may be, this is true. In the sentence "The largest city in Great Britain is London," the subject is not one word, but many. It is, *The largest city in Great Britain*. The predicate is, *is London*.

In the sentence "Finger hurts," *finger* is the name of something, just as *city*, *Great Britain*, and *London* are names of places. These name words are called "nouns." They may name some particular person or place, or merely a group of things. You notice that most nouns begin with small letters, but the names of all persons and places begin with capital letters. The first of these classes we call "common nouns," and the second "proper nouns."

If we went about merely saying nouns to one another, we should not be able to make our



'OH! HOW NICE YOU ARE, TEDDY!'

When the little girl said "Oh!" she uttered what is known as an interjection, as she would have done had she said "Ah!" or "Eh!"



## LITTLE PICTURES THAT SHOW WHAT A VERB IS

The verb is a part of speech that asserts something about something else, or what a thing is, does, has done, or has done to it. In the pictures we can see what the little boys and girls have done. The verbs are printed in large capital letters.

meaning very clear. If a boy shouted "Baby" to his mother, she would probably think that the baby had fallen into a bucket of hot water, or out of bed. If the boy said "Baby" quietly, his mother would wait for the next word. She would want to know what the baby was doing, or in what state or condition he was.

If the boy said "Baby walks," the question in her mind would be answered by the "action" word *walks*. If he said "Baby is hungry," the question would be answered by an "existence" word *is*. Such a word doesn't show action, it merely links *baby* and *hungry*. The words which show action, and those that link the subject to something said about it, are "verbs." *Run, jump, play, eat, sleep, read, write* are all "action verbs." *Is, are, were*, are all "linking verbs."

A ten year old boy named James in talking to his mother would not say, "James is hungry. James wants an apple." He would have noticed that people do not speak of themselves by name, but use the words *I, me*, and the like. He would say "I am hungry. I want an apple." If he were a generous little boy he might say, "John is hungry, he wants one too." The word *he* would stand for John. These substitute words are called "pronouns," because they are used for nouns, and the Latin word meaning "for" is *pro*. *I, he, you*, are all pronouns.

So far we have talked about five of the eight kinds of words, or "parts of speech"—nouns, pronouns, verbs, conjunctions, and interjections. One can build many sentences with only these five kinds of words, but if there were no other parts of speech we should not be able to say many things that we should like to. For example, suppose you had lost your coat and were trying to reclaim it at the lost property office. If you said "Have you found a coat?" nobody could help you very much, because perhaps other people had also lost coats. But if you said, "I have lost a *blue* coat," there would be more chance of your finding it. *Blue* adds to the meaning of coat—it describes it. You might have used *large*, or *old*, or *shabby*, or *new*, in place of, or with, *blue*. All such words as these, that add to the meaning of nouns, are called "adjectives."

If only one blue coat had turned up, you would not have much trouble in claiming your own. But suppose that four coats, and four blue coats, were awaiting their owners. You might have to give the man in charge other details—the *time* you lost the coat, the *place* in which you left it, or *why* you were so long claiming it. You might say, "I lost a blue coat yesterday in a tram." Then *yesterday* and *in a tram* would tell time and place. They would



make the verb *lost* clearer, and would add to its meaning. The coat found in that place (*in a tram*) and at the time (*yesterday*) would be recognized as yours.

Such words or groups of words that narrow down or add to the meaning of verbs are called "adverbs" or "adverbial phrases."

In the sentence "Very heavy clouds rolled quickly across the sky" we shall discover a new way of using a helping word, if we look closely. We have had adverbs modifying or changing the meaning of verbs, but now we have a word modifying an adjective. The writer was not satisfied with saying that the clouds were heavy. He added the word *very* to make *heavy* more intense. *Very* is an adverb modifying an adjective. If the writer had wanted to make *quickly* more intense, he might have said *very quickly*, just as he said *very heavy*. In that case the modifying adverb would have helped out the meaning of another adverb. Adverbs, then, may modify verbs, adjectives or other adverbs.

In some of the little groups of words used so far, as *in a tram*, there are expressions which have not as yet been explained. In the sentence "I lost my coat in a tram," *in* is a new kind of word. It is a "relation" word, it shows a connexion between *lost* and *tram*, but it doesn't mean anything alone. Such words are "prepositions." They show the relation between

nouns and pronouns and some other word in the sentence. Thus in "The boy in the playground has a new bat," *in* is a preposition which shows the relation between *boy* and *playground*. These prepositions always have nouns or pronouns for objects.

Now you have learned the names of the eight parts of speech and something about each of them. All the hundreds of thousands of words in the dictionary belong to one or another of these eight classes. Everything that has ever been thought or written or spoken in the English language has been expressed by grouping together these parts of speech.

Uneducated persons often have great difficulty in making others understand just what they

want to say, because they do not know enough about words and sentences and how to use them. That is why it is important for you to learn "grammar," which is the study that tells you how to use these valuable tools.

You will find many other interesting and important facts about the parts of speech, and how to use them correctly, if you will turn to the articles in this work under the headings Adjective, Adverb, Conjunction, Noun, Preposition, Pronoun, Sentence, Verb.

The real value of grammar may be stated thus. All thought is expressed chiefly through language, and, at bottom, the rules of correct thinking are involved in the study of grammar.

Correct language indeed is the popular form of logical thinking. To analyse sentences, to

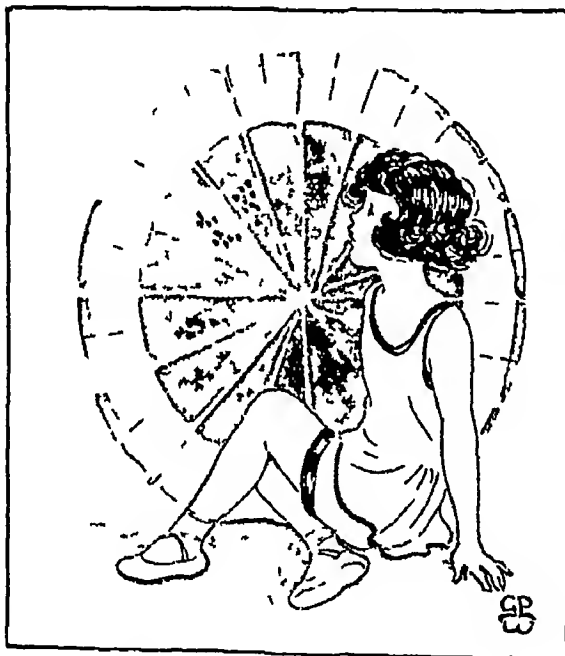
examine the structure and arrangement of the parts, to study the various modes of expressing thought and shades of thought grammatically—these activities have always been regarded as the very best way of teaching the brain to work.

In this respect, grammar contributes an element of logical accuracy to all studies, and lays a basis for correct thinking. The study of grammar also teaches correct usage. Students of more mature years are greatly helped in correcting their faults by insight into the rules of grammar. They learn to criticize themselves and the wrong usages to which they have been accus-

tomed. To speak correctly is the surest way to impart knowledge and make your wishes known.

**Gramophone.** Of all things sound is one of the most fleeting. Fragile ferns and mosses, perishing before there was an eye to behold them, have left imprints for after ages to wonder over, but of the singers and orators of past generations who thrilled vast audiences, every tone was for ever lost as soon as uttered. What would we not give for a miracle which would enable us to hear Homer chanting the fall of Troy, or Demosthenes hurling reproaches against Philip of Macedon, or Gladstone holding the House of Commons with his oratory?

The miracle which will enable future generations to hear the music, the speech, the very

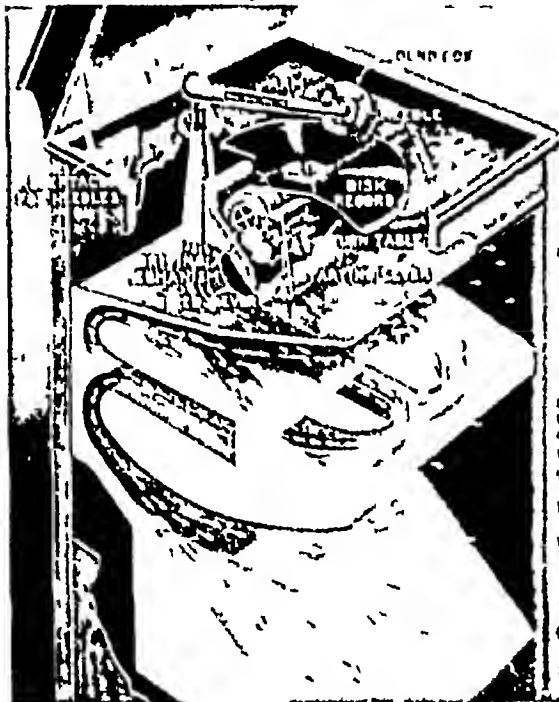


'IT IS VERY HOT TODAY'

If this little girl had said only *It is hot*, she would not have used an adverb. An adverb changes the sense of a verb, adjective, or another adverb, the word, "*very*" is the adverb because it adds to the sense of the adjective "*hot*." "*Today*" is also an adverb.

## GRAMOPHONE

tones and accent of today, was worked out by an American in 1877. Sound is produced by vibrations of the air, and the changing form of these vibrations can be traced, recorded, and reproduced. (See Sound). When this discovery was made, the miracle of the phonograph was as good as performed. Thomas Alva Edison was not the first man to draw this very obvious de-



### HOW A GRAMOPHONE WORKS

This diagram shows a gramophone with the cabinet and other details cut away so that the mechanism can be seen. Follow the arrows leading out of the sound box on the arm and you can trace the course taken by the sound waves through the folded horn used in the latest type of machine.

duction, but he was the first to provide a commercially practical means for recording and reproducing the delicate vibrations of sound. Such instruments are variously called "gramophones" with disk records, "phonographs" with cylinder records, or simply "talking machines." Emil Berliner invented the disk machine.

The basic principle of Edison's invention is the same as that employed in the transmitter and receiver of the telephone. When sound waves strike against a very thin flexible disk called a diaphragm, they cause it to vibrate. If the process is reversed, and a diaphragm is made to vibrate by some mechanical means, it will in turn cause vibrations in the air which will affect the ear as sound, striking against the tympanum of the ear.

In order to record sound, Edison attached a cutting needle to the centre of a diaphragm, and allowed it to rest against a cylinder covered with tin foil. This cylinder he kept revolving rapidly, and also slowly advancing lengthwise, so that the needle described a spiral path round it.

When this apparatus was set in motion, and sound was directed against the diaphragm, the

needle dug into the tin foil along its spiral path. Thus the cylinder was made to record the movements of the diaphragm. If the spiral groove on such a record be examined under a magnifying glass, it will appear as a succession of humps and hollows, so close together that, while the cylinder is turning, several hundreds pass per second.

In order to reproduce the original sound, the process was reversed. The cylinder was set turning, with the needle resting in the groove. The needle dropped into the hollows and was driven outwards by the humps, and this motion was communicated to the diaphragm causing it to give off vibrations similar to those of the original sounds. In other words, Edison's machine now "give out" the same sounds which had before been "put in" playing the part, one might say, first of the human ear in course of listening then of the voice in uttering what the machine had heard.

### Ever Better Gramophones

The gramophone of today is essentially the same as this early instrument of Edison. By far the most important of the early developments was the substitution of a wax cylinder for the cylinder covered with tin foil, which, after a few repetitions, became so worn as to be useless. Later the wax cylinder was replaced, for most purposes, by the disk form of record. This has several great advantages. First the flat disks greatly economize space in the gramophone library, both because they take less room and because records can be made on both sides. Second, they are more durable. Next the driving mechanism is simplified, since a single turntable movement is all that is necessary, while the cylinder type requires additional mechanism to give it the slow lengthwise motion. And finally, the glass or mica diaphragm gave way to one of durable metal.

Only a single record, of course, is made direct from the singer's voice or the orchestra, and it is more precious than gold. To reproduce this, the original or "master" record is dusted with graphite and electrotyped. (See Electrotyping). From this mould thousands of records are stamped almost as easily as a sheet of paper could be printed in the days of the hand press. These disks are made of various "synthetic" plastics, some obtained from coal tar.

Delicate clockwork apparatus, driven by a spring or a little electric motor is used to revolve the record with the absolutely regular motion essential, for the slightest change of speed (the usual rate is 78 revolutions per minute) alters the pitch of the sound. Much ingenuity has also gone to the perfecting of the horns and cabinets used to increase the volume of sound. One of the most difficult problems of the gramophone has been to get rid of the hissing sound produced by the friction

## GRAMOPHONE

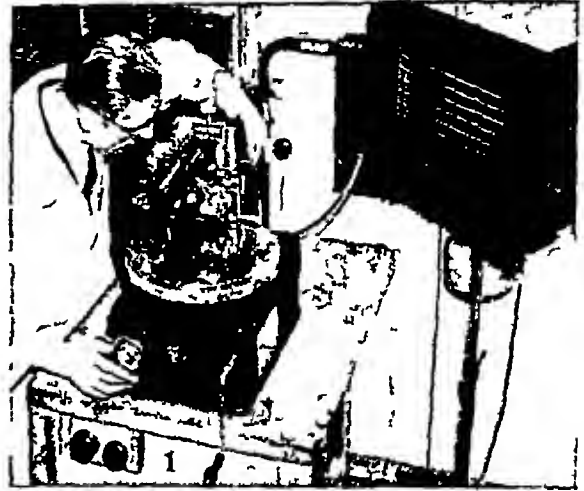
of the needle as it passes over the record. In some machines this has been overcome by sound filters, in which the vibrations are made to travel through a tube filled with substances which absorb or "damp" the short waves of the high-pitched friction noises.

Unbreakable records are made of celluloid or a cellulose compound, the new "durium" process coats a tough paper disk with a special lacquer. This gives a light, flexible record, which withstands handling without injury. The needle, pressing in the groove, spreads the side walls of the groove, which spring back after the needle has passed. There are now several kinds of so called "permanent" needles, made of specially hardened steel, which may be used for 50 or 100 records, and fibre needles, which must be re cut after each record.

In the "micro groove" process, the grooves are so closely spaced that the playing time of the record is practically doubled. A 10 inch disk, for example, will play for about five minutes.

Wireless at first made such inroads into the gramophone business that the latter was only revived by the adoption of principles developed by electrical and wireless engineers, working with acoustical experts. The previous range of two or three octaves for satisfactory reproduction was not enough to record correctly the delicate overtones and nuances which give voice and music its quality, or "timbre." By electrical recording, the engineers were able to increase the scope of satisfactory reproduction to cover virtually the whole range of speech and music.

Another type of gramophone makes use of a delicate electrical current generated by an armature moving inside a coil, the armature



### MAKING THE MASTER MATRIX

This photograph shows the first process in making a gramophone record. From the studio the sound is carried to the recording room, and a test is made. When all is well the engineer lowers the sapphire point on to the wax disk on which the first record will be made, as seen in this photograph.

getting its movement from the needle as it moves to and fro. This current is sent through an amplifier and played by the usual speaker. Many wireless sets are equipped with motor-driven turn tables and electric "pick-ups," so that they may play records or wireless at the turn of a switch. These are known as "radiograms."

Automatic gramophones, capable of playing a long series of records without attention, permit hearing a long programme without the annoyance of changing records.

Millions who will never hear any of the world's greatest singers at first hand have been thrilled by their artistry through the gramophone. Blind students, scholars, and students



### GRAMOPHONE RECORDS IN THE MAKING

The two essentials of gramophone records are that they should not be brittle and that they should be durable. The modern record is made of a composition in which resin plays a large part, minerals and fibres also being used to strengthen the substance. These three photographs show stages in the making of a record. On the left the pressman is scraping the cake of plastic material, which will form the record, from the hot plate. In the centre the cake is being placed beneath the matrix which will imprint the record. Right, a completed record is being removed from the press.

Courtesy His Master's Voice

## GRAMOPHONE

of music find these machines of great value. Records of vanishing races and then songs have been made. Whole wireless programmes are sometimes sent to smaller stations on large records.

Collections of gramophone records of the voices of distinguished persons have been started by institutions such as the British Museum, while the B B C has a huge record library, including "canned effects" for use with radio plays. There are, in addition, the permanent collections housed in the vaults of all the large manufacturing companies. The dicta phone is the application of the gramophone



### A STREET IN PICTURESQUE GRANADA

The city of Granada in Andalusia, besides possessing the greatest relic of Moorish Spain, the Alhambra, is itself very picturesque, especially in its older part, known as the Albaicin. The river Genil forms the southern boundary of Granada and a tributary of it, the river Darro, flows through the city, these houses fronting the ledge-like street beside the stream have a distinctly Moorish character.

One-way traffic only is possible

Dorfen Leigh

principle to the uses of commercial correspondence and secretarial work.

**Granada.** (Pron gran ah' da) One of the most important events in the history of Europe was the conquest of Spain by the Moors.

After the departure of the Romans, Spain was without any strong or stable government, until, in 711, an invading army of Moors from Northern Africa, probably not more than 12,000 in number, landed in Spain, and defeated the very much larger armies of the Gothic king who opposed them. Before long the whole of Spain was conquered by the Moors, or Saracens, and when the country was re-conquered by the Christians, the kingdom of Granada was the last territory to be recovered, and it was not until 1492 that the Moors lost the last remnants of Granada.

## GRAND CANYON

It was as late as 1609 that Philip III drove the remaining descendants of the Moors, who were probably the most industrious and able of his subjects, and who then numbered about a million, back to Africa. Few things in European history are more astonishing than the hold which this race of Mahomedans, possessing a civilization and a culture far superior to the European people they conquered, maintained in Spain for so many centuries.

Granada was founded by the Moors in the 8th century, and in the 13th century, when it was the capital of the Moorish kingdom of Granada, it had a population of 700,000, and was one of the most splendid cities in the world.

The history and monuments of this one city are in themselves eloquent proof of the remarkable achievements of the Moors in Spain. At a time when the greater part of Europe was in a state of barbarism, civilization bloomed in Spain.

Beautiful buildings were everywhere erected, such cities as Seville, Cordova, and Toledo, in addition to Granada, were built by the Moors, while, as a result of their schemes of irrigation, agricultural resources were developed to an extent unknown before or since.

Today, the ancient Moorish capital is but a remnant compared with its former splendour, and its population is probably one seventh of what it was 600 years ago. But it still occupies the same picturesque situation, built on

two hills, with the river Darro flowing through it. The great palace of the Moorish kings, the Alhambra (g v), stood on one hill, and another Moorish palace, the Generalife, on the other.

The old town, Albaicin, is the poorest part of the city, but it is also the most picturesque. The modern city does a large trade in agricultural produce, while the manufactures include soap, paper, gloves, and liqueurs. The population of Granada is about 125,000.

**Grand Canyon.** When you stand on the rim of the 200 mile gorge, cut by the Colorado River through the high plateau of northern Arizona, you are overwhelmed with awe. The Grand Canyon of the Colorado is the longest and deepest canyon in the world.

Look across the yawning depths of the stupendous chasm to the opposite wall, ablaze



### WONDERLAND OF THE GRAND CANYON MADE BY THE MIGHTY COLORADO RIVER

The incomparable glory of the Grand Canyon is spectacular enough without the added beauty of the variegated colouring of the cliffs. Here the river Colorado cuts through the plateau of Arizona between rocky banks. This photograph from the air shows the scene after a rainstorm has transformed the dull red of the sandstone into a vivid vermilion. Fiery clouds are still scudding above the flat-topped plateaux. Those who have visited the Grand Canyon say that the colours shown above are not in the least exaggerated.





### THE GREATEST CLEFT IN THE GLOBE'S SURFACE

ONE of the world's scenic wonders is the Grand Canyon of the Colorado. The photograph on the previous page shows some of the beauty of its colouring, but the vivid scarlet of the rainsoaked sandstone is not the only beauty of colour that it offers, for there are cream coloured cliffs, spaces of varied green, and rocks of sombre black. In the previous photograph the distance is obscured by the rain clouds that have just passed, but in that above, taken under a cloudless sky, the awe inspiring area of this great waste land cut in two by the hundreds of miles of canyon can be realized. As far as the eye can see, folded ranges of rock tower into the air, for all the world like a giant tablecloth rucked into pleats by a supernatural hand. Down at the bottom of the gorge runs the Colorado river, which is still cutting deeper and deeper into the rocky mass.

# THE GRAND CANYON—A MIRACLE OF NATURE



So stupendous, so incredibly vast and magnificent, is the Grand Canyon, that, as one writer says, "It has swallowed all the words in the dictionary suitable for describing the impression it makes on the eye, and it still remains undescribed." Here we see how the tributaries of the Colorado have cut up the original mass into the "temples" and buttes. Some ledges are red, some yellow, some gray. Purples and blues and greens appear in certain lights. The effect is like a great broken rainbow.

## GRAND CANYON

with bands of glowing colours! Peer over the edge, and far below you see what appears to be a tiny silver thread! It is the swift-flowing Colorado, one of the large rivers of North America. It looks very small because it is a mile below you. At the top the Canyon is 8 to 12 miles wide.

From the rim to the river's brink the walls descend in a succession of cliffs and terraces, like a giant's staircase, each step several hundred feet high. The barren rocks of white, buff, dull red, and green have been carved into a bewildering variety of shapes and forms—"buttes" (flat-topped hills) and pinnacles, alcoves and "Oriental temples" crowned by battlements.

Few have seen more than a tiny fraction of the canyon's wonders, for the journey through the length of the gorge is made extremely dangerous by the many rapids, in some of which the river attains a speed of nearly 25 knots.

The first man to go through the canyon was Major J. W. Powell (1869), whose fascinating narrative of his explorations remains one of the classics of American travel.

Even the hardest frontiersmen shunned the unknown perils of engulfing whirlpools, underground passages, and giant falls which Indian legend attributed to the Canyon, until Major Powell organized a party of ten to thread the gorge from end to end. Dangerous enough the adventure proved, though the underground channels and giant falls were found to be nothing but myths.

On the day the journey ended, just before Major Powell and the faithful few of his band emerged into safety, four men deserted, hoping to scale the walls, and were never heard of again. They doubtless perished, either from accident or from starvation. Since then, the Grand Canyon has been the scene of numerous scientific expeditions. In 1937 a party of explorers managed to climb to the "Lost World" on some of the island-peaks in the Canyon.

**Granite.** If you look closely at a piece of granite, you will see that it is made up of more than one kind of material, and if you could crush it to powder, you would be able easily to pick out tiny fragments of the separate substances that compose it. The chief minerals are quartz, felspar, and mica. The colour of granite depends on the proportions and varieties of the minerals present. The prevailing colour is grey—light grey if dark minerals are few, dark grey if they are abundant. Greenish, pink, and red hues are frequently seen, usually due to different kinds of felspar.

Granite belongs to the group of "igneous" rocks—that is, it was formed ages ago by the cooling of liquid lava. This cooling took place far below the earth's surface and very slowly, thus giving plenty of time for the formation of

## GRANTHAM

crystals. Granite belongs to no particular geological age, but was formed in all periods, and may be forming now far below the earth's crust. It is one of the most widely distributed of rocks.

Fresh granite is a very hard stone, but like other rocks it may decay and crumble, one of the products so formed is the kaolin, or china clay, so extensively used today. Because of its great hardness, granite is difficult to work, and so is an expensive building stone. It is used chiefly for road metal, or as paving blocks, for monuments, and for large buildings, where great strength and durability or beauty of finish are required. Many varieties are exceedingly beautiful in colouring, and take a high polish.

Aberdeenshire, Kirkcaldy, Brighton, Cornwall, Cumberland, and Derbyshire supply us with much of our granite.



**GRANTHAM'S PARISH CHURCH**

The chief pride of Grantham is the parish church, dedicated to St. Wulfram. The greater part of it was built in the 13th century. The graceful spire was added in the 14th century, and is 280 feet high. It is famous also for its window tracery and chained library.

*Photo Valentine*

**Grantham.** Sir Isaac Newton was educated as a boy at the King Edward VI Grammar School at Grantham, before going to Cambridge University. This fact is sufficient to entitle this busy Lincolnshire market town to an honourable position in English history.

Grantham is a municipal borough, situated 24 miles south of Lincoln, and 105 miles north of London. It is an important centre and junction of the main line of the London and North-

## GRANTHAM

Eastern Railway, and its modern development has found expression in the growth of engineering works concerned chiefly with the manufacture of agricultural machinery and oil and gas engines, and affording employment to large numbers of workmen.

One of the principal physical features of the country in the neighbourhood is the line of hills composed of oolitic (fossiliferous) limestone, and known as the Cliffs, which stretches for fifty miles from Wintingham, on the Humber, and ends at Grantham. From this Cliff, near Grantham, is quarried an excellent building stone, known as Lincolnshire limestone. The Cathedral at Lincoln is built of this material, and is proof of its lasting qualities.

The glory of Grantham is its parish church, dedicated to Saint Wulfram, with its beautiful tower and spire, 281 feet high, regarded as the finest church spire in the county of Lincoln. It was finished about the year 1300. The church is famous, too, for its window tracery and chained library. Another ancient building of which Grantham may well be justly proud is the Angel Inn, a fine example of a medieval inn, dating from the 14th century. The population of the town is about 19,700.

**Grape-fruit.** The grape fruit belongs to the same group of "citrus fruits" as the orange, the lemon, and the citron, the best varieties are about twice the size of a large orange.

The grape fruit (*Citrus decumana*), also called pomelo, has only been marketed to any extent since the early part of the 20th century, although it was taken to the West Indies and Florida by the Spaniards, along with the orange and lemon. It has also been introduced into the hill regions of India. The tree is very beautiful, with dark glossy leaves, downy white beneath, and has large sweet-scented blossoms, which are succeeded by the great clusters of lemon yellow fruit.

In no place in the world has the culture of grape fruit reached such perfection as in Florida, U.S.A., where it now constitutes a very important crop. Its cultivation has been extended also to California, Jamaica, and Cuba.



ON A GRAPE FRUIT PLANTATION

Fox

One of the latest fruits to be introduced to Europe is the grape fruit, which has become increasingly popular as a breakfast fruit and often forms the first course at other meals. The consumption of the fruit has greatly increased in Britain since the War. Most of the supply comes from Florida, but about 25 per cent is grown in the West Indies. The photograph shows a worker on one of the West Indian plantations after gathering the fruit.

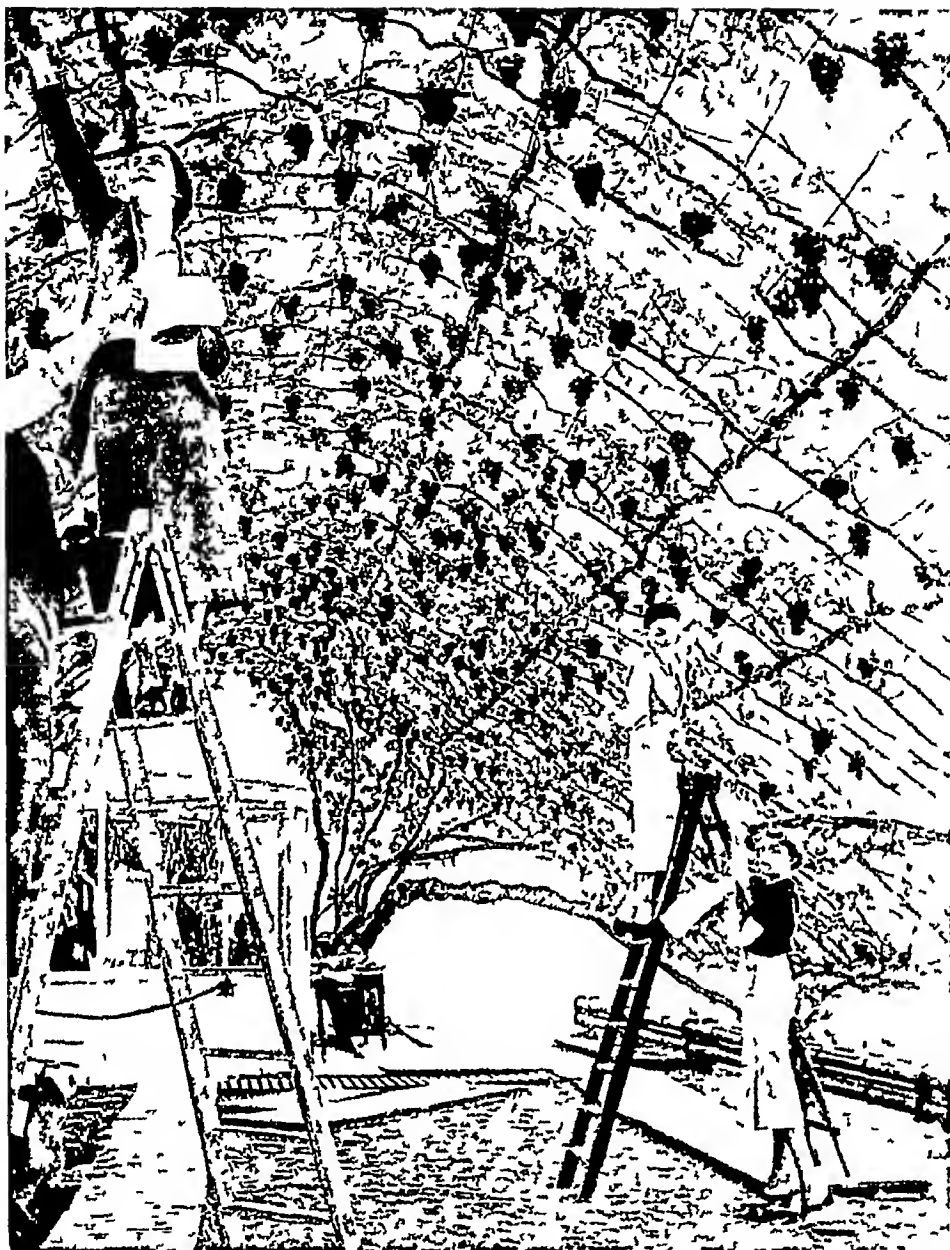
As a breakfast fruit grape fruit is excellent. It is a fine "appetizer," and its characteristic flavour, which is an indescribable blending of sweet, sour and bitter, is most pleasant, stimulating gastric secretion and appetite. The tree is small, growing to a height of only 25 feet.

The grape fruit is usually budded on its own stock or on the sour orange. The tree is a heavy bearer, and begins to yield as early as the orange tree—in about six years—but it is more easily injured by cold.

**Grapes.** Grapes have furnished men with food and drink since the dawn of history. Grape seeds have been found with mummies in Egyptian tombs at least 3,000 years old, and it is believed that the grape was the first fruit to be cultivated. The original home of the vine was Asia, whence it was brought to Europe probably by the Phoenicians.

It is thought that the grape vine (*Vitis vinifera*) was brought to England about the first or second century of the Christian era, but it is possible that its introduction was of even earlier date. In some parts of England, chiefly in the south-west, grapes ripen in the open, but usually they are grown under glass.

When attempting to grow vines in the open it is necessary to make sure that they are planted in positions facing the south or west.



GRAPES FROM A ROYAL PALACE

The most famous grape-vine in England is undoubtedly the one planted in Hampton Court Palace garden in 1768, and it still produces Black Hamburg grapes of the finest quality. In this picture of the vine you see the grapes being picked for sale to the public in wicker baskets made by blind ex-Service men—a modern charitable use for an ancient institution.

Many varieties of this luscious fruit may be produced, among them being White Sweetwater, Miller's Burgundy, Chasselas Vibert, Muscat, Black Hamburg, Diamond Jubilee, Black Alicante and Gros Maroc.

In indoor cultivation the glass-house should be fitted with heating apparatus, so that an even temperature can be obtained. The border should be on the ground, partly inside and partly outside, and properly drained, and a place should be made in the walls for the roots to pass through. The shoots should be trained up the walls and along the glass of the roof.

The distinctive colours of grapes are entirely in the outer skin, which may be green, red, yellow,

purple, or even variegated. Some times grape vines remain fruitful for 200 or 400 years.

Wines are made by fermenting the juice of the grape. During fermentation a greyish or reddish crust forms in the vat, and thus, a crystalline substance called "argol," becomes, when refined, the "cream of tartar" used in medicine, in effervescent drinks, and in baking-powders. (See also Wine)

**Graphite.** In appearance graphite is so different from the diamond that it is at first difficult to believe that the black, opaque, soft graphite is chemically identical with the colourless, transparent, precious stone, the hardest of all known substances. But, like the diamond and coal, graphite is one of the crystalline forms in which the useful element carbon is found.

One of the familiar uses of graphite is for the "leads" of black pencils. Because it is a good conductor of electricity it is also much used in electrotyping and electrical apparatus. Graphite makes an excellent lubricant, since the countless minute flakes of which it consists easily adhere to any rough metal, producing a smooth surface and so reducing friction. In the special form known as colloidal graphite, it is used as a mechanical lubricant in motor cars. Most of the world's graphite, however, is used with clay and sand to make heat-resisting crucibles and retorts, for paints and for stove polish.

Ceylon, that most wonderful gem producing country, is the world's largest producer of mined graphite. Mexico, the United States, and Cumberland are among other producers.



